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Practice-Led Methods I Indigenous Knowledge
by
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A thesis submitted in partial fulfillment of the requirements for the degree of

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ARTIFACT FOR MASTER OF DESIGN 2014



fete

From Earth To Earth

PRACTICE-LED METHODS | INDIGENOUS KNOWLEDGE

...**fete**, the name comes from the philosophy of **Benevolence**: a sense of creating profound balance and harmony, essentially a commitment to achieve an alignment with the interests of other people, nature and your own. In it's totality, it's about **first giving and then receiving**; you think of the other and the other will think of you. It is this cycle that maintains the balance and harmony of **fete: From Earth To Earth.**

fete

From Earth To Earth

PRACTICE-LED METHODS | INDIGENOUS KNOWLEDGE

Dedicated To My Family & Dr. Gavin Renwick

THE FIRST STAGE IN EXTRACTING AND
DOCUMENTING **TACIT**/PROCEDURAL
KNOWLEDGE IN PRACTICE-LED RESEARCH
IS TO MAKE ONESELF CONSCIOUS OF THE
TACIT/PROCEDURAL KNOWLEDGE THAT
ONE HOLDS...

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ABSTRACT

For creative professionals, there is an increasing need to cross traditional disciplinary and institutional boundaries. The sharing of methods and tools amongst disciplines allows designers to design from a more holistic and empathic spectrum of cultural, economic, and environmental perspectives. The main purpose of this study is to disclose how practice-led methods are empathic to indigenous knowledge as means to contextualize connoisseurship—an aspect of tacit/procedural knowledge ingrained in practice-led disciplines and indigenous knowledge. Practice-led disciplines, such as design, have adopted this focus as a means to define specific forms of knowledge in fields of practice that are often referred to as practical, experiential, personal, or tacit knowledge. These can coincide with and fit within the area of explicit knowledge. The literature on indigenous knowledge and practice-led methods includes study of the alliance of practices, intuition, practical knowledge and skill. An action that cannot be defined in facets or disseminated using instructions (as no instructions for it exist) can only be transferred from master to apprentice. This is known as tacit/procedural knowledge. This research proposes new design sensorial methodology to help extract connoisseurship: an aspect of tacit/procedural knowledge found within practice-led methods and indigenous knowledge. Such methods can create a platform to achieve measurable results that can be verified to test the academic credibility needed for research. This research proposes a model useable for future research, that will help achieve an understanding of the role and format of tacit/procedural knowledge in practice-led research.

KEYWORDS

Practice-led Methods; Tacit Knowledge; Indigenous Knowledge; Empathy; Sensorial Methodology; Explicit Knowledge; Resilience; Sustainability; Interdisciplinary Collaboration

RESEARCH QUESTION

How are practice-led methods empathic to indigenous knowledge?

PROLOGUE

Knowledge plays a role in our lives in that it provides the building blocks for how we perceive and come to understand the world around us. It shapes our behavior. In this sense, this research has emerged over a period of 17 months worth of research—from February 2013 to July 2014—and discusses the importance of acquiring an understanding of the type of knowledge entrenched in creative and practice-led disciplines. It also discusses how this knowledge is crafted through practice for the purpose of making it communicable.

Such an understanding is formed by following the analysis of secondary data with the help of my supervisor, Gavin Renwick, and other professors at the University of Alberta, including John Parkins and Rick Szostak, all of whom helped to form my fundamental understanding of the topic and to whom I extend my gratitude.

This thesis project started when I wrote a paper in one of my graduate classes DES 681, Theory and Research in Design Studies 2, in the winter semester of 2013 at the University of Alberta. The paper elaborated mainly on how designers could work in teams using various skills and knowledge to bring multiple perspectives to projects and emphasize the best solutions to be crafted through collaboration. The paper facilitated collaboration among the students of DES 681 and museum curators from Royal Alberta Museum to come up with meaningful, intelligent solutions that apply an interactive design approach to encourage public interaction with the museum's artifacts. It examined traditional and non-traditional museums and how these museums engage in public dialogues about art, history, culture, etc., as a means to create public interaction with the museum's artifacts.

Through DES 681 paper, I began to understand the importance of interdisciplinary collaboration if we, as designers, are to design from an empathic and more holistic perspective. Coming to a full understanding, was quite difficult because of the lack of appropriate data sources in the area of more holistic design. I kept asking myself: What am I really looking for in my research? As I read more and more references on topics such as empathy, user-centered design, anthropology, design education, interdisciplinary-

collaboration, sustainability, resiliency, indigenous knowledge, etc. Such topics made me realize the abundance of secondary sources that could answer the question of where my research was going.

For the secondary data, I consulted various libraries: the Rutherford Library, the Toronto Reference Library, and the Dorothy H. Hoover Library, where I talked to various librarians. These included James Forrester, Alex Homanchuk, Martha Chudolinska, Sarah Polkinghorne, Angie Mandeville, Grant Kayler, and Anne Carr-Wiggin, who helped me collect secondary data and literature reviews. The collected references alluded to various thoughts about how one should go about designing from a sustainable perspective; but it was difficult to pinpoint which area would lead me to an answer to the question of how to design from a more holistic perspective.

I found myself in an arena filled with numerous design philosophies of which I had little to no knowledge and I could not decide which philosophy would help me form fundamental thoughts in order to build a thesis topic. Following five months of reading and analysis, I went back to the Rutherford Library in September 2013 and talked to a librarian, Sarah Polkinghorne, who is an expert in the subject of art and design. Following our discussions, she recommended that I make an appointment to see John Parkins and Rick Szostak, both of whom have experience working within an interdisciplinary, collaborative framework. Both of these professors suggested that I form three key questions from which I would analyze the collected secondary data. These three questions were:

1. What type of knowledge is embedded in the field of art and design?
2. Is this knowledge transferable? If yes, how is this knowledge transferable?
3. Can this knowledge be extracted and documented for the purpose of enhancing or supporting other types of knowledge found in non-creative disciplines?

The next stage was to re-examine the secondary data from the perspective of answering the three questions to form one new thesis question. How are practice-led methods empathic to indigenous knowledge? From September to December 2013, this was my main focus. In December, I met again with my supervisor, Gavin Renwick, and showed him a clear understanding of the focus of my research: to contextualize connoisseurship—an aspect of tacit/procedural knowledge ingrained in creative and practice-led disciplines. Tacit/procedural knowledge is an element of tacit knowledge which I am interested in capturing and making explicit using the proposed sensorial methodology. To do this, I had to look at a segment of society where the formation and dissemination of connoisseurship was possible: indigenous people. They have sophisticated arrays of knowledge that help illuminate why tacit methods of practice remain tacit and how one might make them explicit. From January onwards, my goal was to write and design a book that would focus on how practice-led methods are empathic to indigenous knowledge, and how this would further my graduate research. Both practice-led methods and indigenous knowledge

have a tacit character and within this I am interested in making expert knowledge (connoisseurship) explicit.

Through anecdotal and secondary research, which are stories of tacit knowledge, I began to understand we are all indigenous. As you read these examples, you might come to share this belief, and realize that you or someone you know has used indigenous/tacit knowledge in day-to-day activities without knowing its significance. The examples help demonstrate the importance of collaborative knowing, doing and disseminating tacit/procedural knowledge. The benefits are economical, cultural, health-related, environmental, and above all, sustainable.

This research begins by illustrating the meaning of sustainability and the role of designers by looking at how they are not mindful of the materials to be used in the production process. It also examines how indigenous people have broad levels of tacit knowledge for living sustainably by using the concept of resilience and how we designers might learn from this. It then examines how practice-led methods are empathic to indigenous knowledge, to understand the role and format of connoisseurship—an aspect of tacit/procedural knowledge. The final section of this research harvests proposed sensorial methodology to help extract connoisseurship, to be made explicit in practice-led methods and indigenous knowledge. The sensorial methodology is inspired from the practice-led research that went into designing and producing "The Edible Book," a research project completed at OCAD University (formerly Ontario College of Art and Design). Such methodology can create a platform for measurable, verifiable results with the academic credibility needed for research. It may also encourage interdisciplinary collaboration amongst working professionals and elders to plant the seed for sustainable change.



ANECDOTAL & SECONDARY RESEARCH





INTRODUCTION

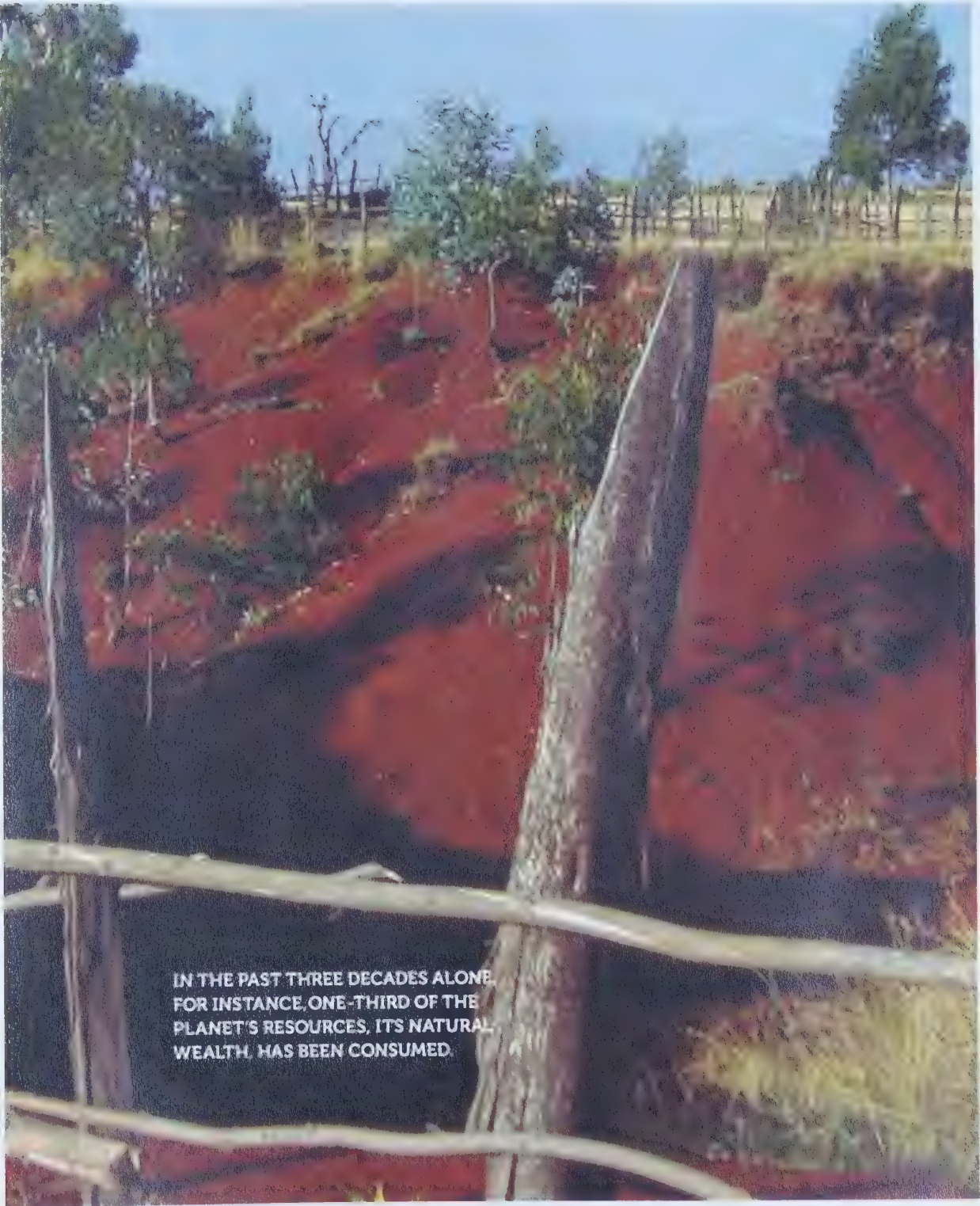
This book explores the meaning of sustainability as depicted through indigenous living patterns to illustrate a new proposed design methodology. This may encourage interdisciplinary collaboration and dialogue to address “design for resilience” and lead to more eco-conscious, more holistic and empathic design methods. They emphasize the importance of promoting forward-thinking decisions in the development of current products and services, while encouraging foresight, developing sustainable scenarios and influencing pro-sustainable consumer behavior.

Designers often find it a challenge to implement such frameworks and tools. The technical requirements related to full life-cycle analysis, full life-cycle costing, new material considerations and increased standardization are all outside of traditional design expertise and are thus not fully understood. Generally, design differs from other disciplines, such as science and management, in that these disciplines are concerned with understanding how things are, whereas design is more concerned with how things need to be. As we design for the sustainability of our future, it is with the notion that we must collectively aim to overcome our consumer habits and start living responsibly.

The concept of sustainability became a part of public consciousness years ago, but more recently our ways of living have conflicted increasingly with the symbiotic flow of nature. This is why we feel the need to assign value to words like sustainability—to elucidate the symbiotic relationship humans once had with nature, which in large part we have forgotten. Sustainability

is about promoting forward-thinking decisions that consider the environmental, economical and cultural implications of our actions through time. The notion of sustainability essentially means taking more holistic approaches to designing in order to mimic the best behaviors of the natural environment (Birkeland 173–92).

The effect that the world’s population has had on the environment through our conventional style of consumption has manifested itself in the belief that what doesn’t harm us could not possibly harm the environment. The results of our actions reveal that people largely disregard the environment in pursuit of their own lives and success. The growing global concerns around environmental problems such as solid waste, water pollution, air pollution, energy consumption, forest depletion and climate change are very much the results of our current modes of consumption (Ibid). According to Hawkins and Lovins, “In the past three decades alone, for instance, one-third of the planet’s resources, its natural wealth, has been consumed”



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SUSTAINABILITY IS ABOUT PROMOTING FORWARD-THINKING DECISIONS THAT CONSIDER THE ENVIRONMENTAL, ECONOMIC AND CULTURAL IMPLICATIONS OF OUR ACTIONS THROUGH TIME. THE NOTION OF SUSTAINABILITY ESSENTIALLY MEANS TAKING MORE HOLISTIC APPROACHES IN ORDER TO MIMIC THE BEST BEHAVIORS OF THE NATURAL ENVIRONMENT.

(Birkeland 173). To better understand how our current methods of production, consumption and disposal are destroying our global life-support system, the following six categories will examine how a simple process of newspaper production and packaging can have a substantial impact on the environment:

SOLID WASTE

1

Solid waste refers to materials that are not wanted by their producers, such as fly ash from industrial furnaces created during the production process. After a newspaper has been read, it loses its value and becomes solid waste. As well, various types of packages that have been opened and emptied of their contents are also a form of solid waste. The problem is not the amount of rubbish, but rather the accumulation and growth over time of the harmful toxins from inks, adhesives, bleached pulp, and plastics that leach into the surrounding soil and water sources, in addition to the waste that sits in landfills (Rehan 81–83).

2

WATER POLLUTION

According to Imhoff, the slow leaching process of toxins into the water creates unsafe sources of drinking water. On average, more than one billion people worldwide use unsafe sources of drinking water. The production process of paper—the main substrate for packaging—is ranked amongst one of the top industries that are the most dangerous to the water supply due to the environmental damages incurred during the manufacturing of the byproducts pulping and bleaching. Plastics and inks used in the packaging are ranked at the same level on the scale of negative impacts to our water sources (Gore 224–42).



AIR POLLUTION

3

Materials and their byproducts from the manufacturing process contribute significantly to pollution; however this is only a small component of the problem. The materials used to construct the packages that transport newspapers require an enormous amount of fossil fuel energy; burning these fuels results in high levels of air pollution. In 2002, the World Health Organization estimated three million deaths were attributed to breathing polluted air. On a comparative note, the same year the number of deaths due to car accidents was one-third of that. These figures are clearly indicative of the enormity of the problem (Gore 224–42)

4

ENERGY CONSUMPTION

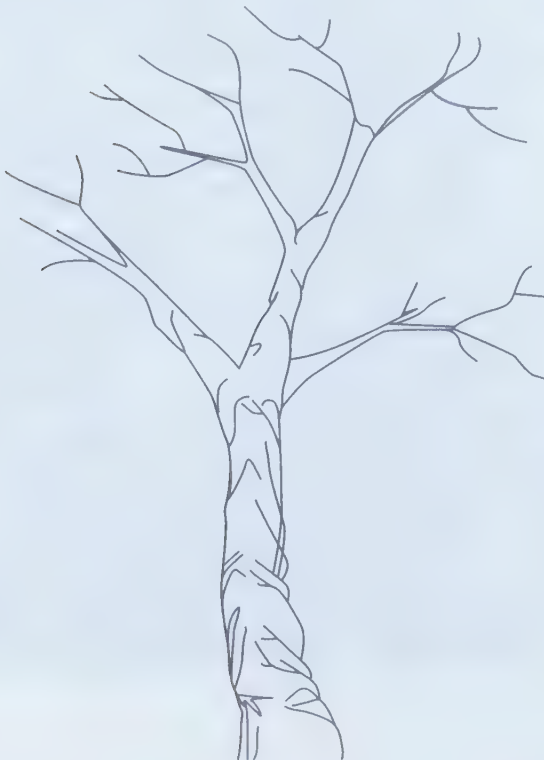
Energy consumption within the lifecycle of packages can be considered as the fundamental problem with packaging. The paper industry is the fourth largest consumer of energy. Adding in the energy used to cut trees for making paper and extract petroleum for transportation, it is safe to say that paper is one of the primary contributors to environmental problems (Gore 50–62)



FOREST DEPLETION

5

As stated by the Rainforest Alliance 40 hectares or 100 acres of tropical rainforests, are lost every minute. This means that 33 trees are lost every second. The demolishing of forests leads to the obliteration of biodiversity, ejecting high levels of pollution into the air that damage the natural clean water filtration system. The destruction of the natural carbon dioxide-to-oxygen filtration system threatens the survival of humans. (Gore 170–96).



6

CLIMATE CHANGE

The first comprehensive global warming warning was issued in the late 1980s; over the past two decades, climate change has become a prominent part of our cultural dialogue. (Gore 300–05). Even with the growing awareness of global warming, not many people actually know that only 8% of the natural material extracted from the earth goes into the final finished product. In other words, the production process involved in generating newspapers and packaging is not only harmful to the environment and contributes to climate change, it is also economically inefficient (Gore 10–30, 312)



The percentage of bio-product waste and current methods of production, energy consumption and disposal are all destroying our global life-support system (Birkeland 173–92), but despite increased environmental damage, consumption habits have yet to change. Now more than ever, it is important for designers to understand the lifecycle of a material in order to increase the likelihood of the material being reclaimed and used again. We need to better understand the divergences, identify pitfalls and highlight creative and analytic practice-led methods to endure the disruption of our current life-support system, but maintain elasticity within the methods of practice. This may enable designers to acclimate to some foreseeable hindrances such as scarcity of resources and global climate change. It is evident that the current patterns of consumption and production are unsustainable. In response to the human-driven crisis of economic growth, societal improvement and environmental sustainability, resilience has emerged as a major concept in the context of sustainability.



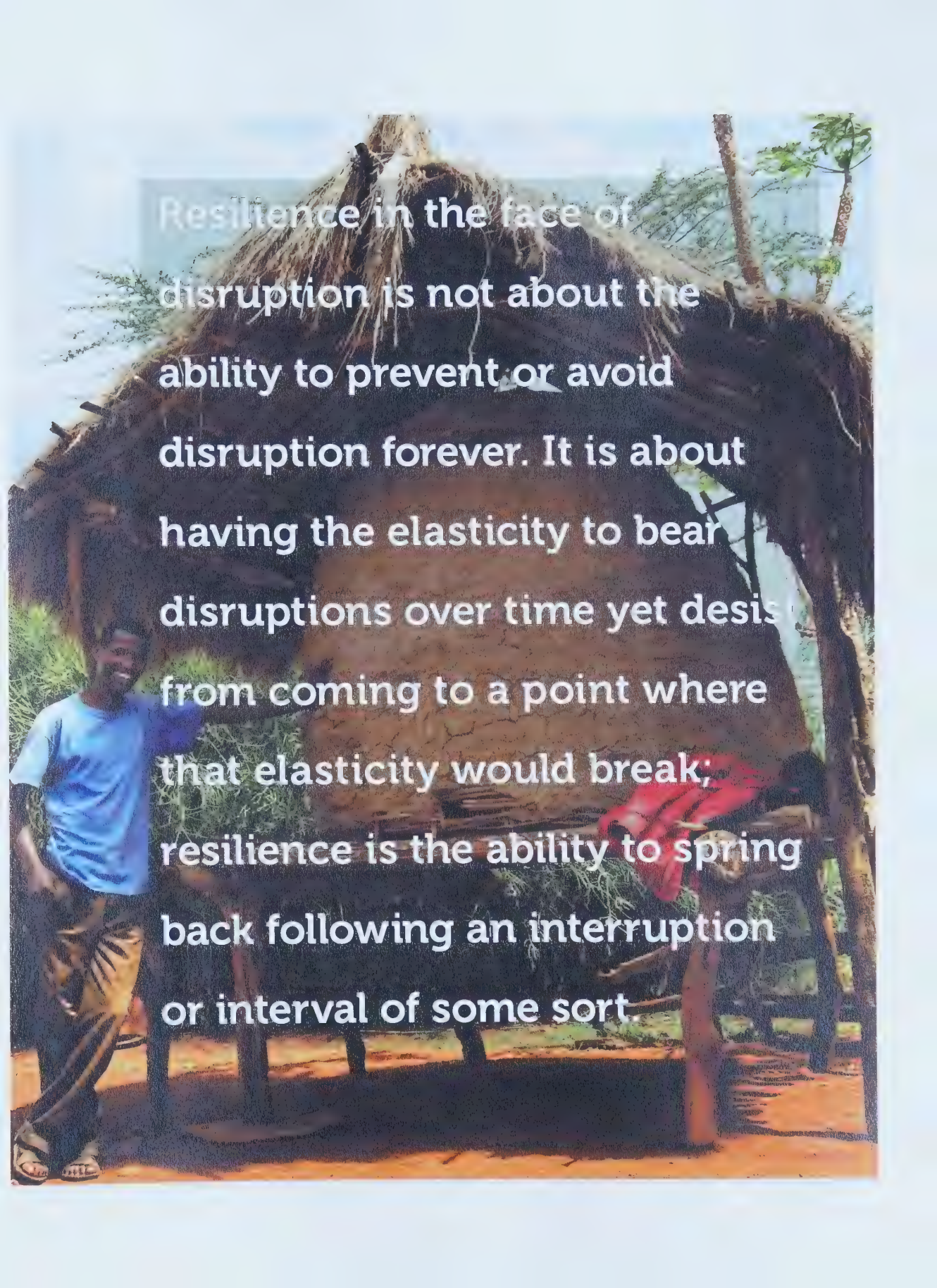


1.2 THE CONCEPT OF RESILIENCE

Resilience, in the face of disruption, is not about the ability to prevent or avoid disruption forever. It is about having the elasticity to bear disruptions over time yet desist from coming to a point where that elasticity would break. Resilience is the ability to spring back following an interruption or interval of some sort. Humans have a tendency to observe and react to abrupt changes; however, when the change is gradual, such as the impact to the environment, our ability to recognize and respond accordingly becomes deficient. The concept of resilience can help one understand and document gradual changes to the environment, thereby prompting designers to design in a way that allows resilience within the design.

The term resilience comes from the field of ecology; C.S. Holling defined it as "a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables" (Holling 14). The Resilience Thinking theory is carved from three interconnecting central concepts: **resilience, adaptability, and transformability.**



A photograph of a man in a light blue t-shirt and patterned trousers standing next to a traditional thatched hut. The hut has a steep, conical roof made of dried grass or straw. The man is smiling and looking towards the camera. The background shows some greenery and a clear sky. The text is overlaid on the image in a white, sans-serif font.

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INDIGENOUS SURVIVAL DEPENDS STRONGLY ON MAINTAINING COLLABORATIVE GENERATIONS' WORTH OF KNOWLEDGE, FROM CLOSE OBSERVATION OF ENVIRONMENTAL PATTERNS TO DISTINCTIONS OF PLANTS, ANIMALS, AND NATURAL PHENOMENA.

"Resilience thinking" creates a platform for fragmented thought and views of systems operating over many connected levels of time and space, elucidating how materials and systems absorb change and adapt to disturbances (Pisano 12–14). To illustrate, indigenous survival depends strongly on maintaining generations' worth of knowledge, from close observation of environmental patterns to distinctions of plants, animals, and natural phenomena. This knowledge is then combined with the development and use of appropriate technologies for primary resource utilization and resilience (Dei 18; Unknown 6–9). Indigenous people rely on nature and nature relies on adaptation; adaptation emerges to build resilience.

During my Master's research, I was diagnosed with Cardiovascular Obstructive Pulmonary Disease (COPD), a lung disease that damages the airways and breathing tubes that carry air in and out of the lungs. Following the diagnosis, doctors prescribed heavy steroids and an inhaler to help with breathing. However, the weeks after the diagnosis showed little to no change in the condition when using the prescribed medicines. The harsh winter of Alberta further contributed to the decline of my condition, to the point where I would start to cough blood due to blockage of the breathing tube and the steroids caused constant migraines. As my health steadily declined, my grandfather, a retired agricultural scientist who had been studying medicinal plants for many years, suggested the following traditional herbal remedy to help improve my condition: Combine "*Ocimum Tenuiflorum*" (Tulasi) Holy Basil leaves, one green tea bag,

some whole black pepper, a little bit of fresh crushed ginger, one cinnamon stick, cloves, three green cardamom pieces, and one black cardamom in a pan of water and heat until the water starts to steam. Then pour the steaming water into a cup and drink slowly, taking small sips as if one were drinking tea; repeat this three times a day. In addition, bend over the steam coming off of the boiling water whilst covering one's head with a towel and inhale the steam for five to ten minutes; repeat three times a day. Finally, let the water boil for the duration of the time the patient with asthma or COPD is in the room. This generates moisture in the room, encompassing all the fumes from the ingredients to prolong the treatment of opening the blockage within the breathing tube and thereby helping to avoid future asthmatic attacks.

I repeated these steps for two weeks and I saw drastic improvements. Drinking the water was only to be done when I felt an asthma attack coming on or was starting to exhibit signs of a cold, which in COPD turns quickly into an asthma attack. Following the indigenous remedies, my condition has improved significantly and I have not had an asthma attack in five months. The effectiveness of this traditional herbal treatment encouraged me to document my observations, and now these observations can be used as a basis for comparisons of pre- and post-effects of using steroids and an inhaler versus the indigenous remedy for a more scientific and concrete conclusion.



● ● **EXAMPLE :**

● Similar to the example before, the following
 ● example showcases an article that was
 ● published in the National Post on May
 ● 15, 2014, by Tristin Hopper. This article
 ● specifically focused on the controversy
 ● surrounding the willpower of an 11-year-
 ● old girl who made the decision to stop
 ● chemotherapy and start using indigenous
 ● remedies to treat cancer. The young girl
 ● was diagnosed with Acute Lymphoblastic
 ● Leukemia (ALL), a common type of cancer
 ● found in children. The child opted out of
 ● using chemotherapy following its acute
 ● side effects and due to lack of protocols in
 ● place at the hospital in Hamilton, Ontario. In
 ● its stead she relied on indigenous medicine
 ● to help treat the cancer. In the interest of
 ● this thesis the focus of this example has
 ● remained on the child's decision to treat
 ● cancer with indigenous medicine and
 ● not the legal issues surrounding the case
 ● The girl will remain anonymous as will
 ● any details of the outcome of stopping
 ● chemotherapy and using indigenous
 ● medicine.

In both examples given above, the decisions to not to use conventional pharmaceutical medicines were made due to their side effects. It is important to note that I would not completely rule out pharmaceutical medicine and preach to those who are ill that they should start using indigenous medicine. More observational scientific testing of the indigenous medicine to support and solidify the results is required. However, based on my personal experience, resilience plays an important role in our everyday lives. Disruptions are unpredictable and resilience is essential in all aspects of life, whether tangible or intangible, if we are to survive and live in harmony with the environment.

According to Lindsay James and Mikhail Davis, authors of "What's in your seed bank? Lessons for building resilience 2014," disruption is inevitable, and those who have an action plan to encapsulate and preserve their DNA will survive. Lindsay and Mikhail refer to an example in nature around the adaptive cycle of lodgepole pine and its adaptive evolution to be resilient. Adaptive species such as the lodgepole pine require the assistance

of forest fires for their long-term survival. To illustrate, lodgepole pine is extremely flammable; as a result of their exposure to heat from fire, their cones open and release seeds. Rather than avoiding such a disruption, the lodgepole pine embraces it. It is resilient because its seeds will persist and sprout swiftly on the ground exposed by the fire (Lindsay and Mikhail). For lodgepole pine, fire represents a facet of life and is essential for long-term survival. This example describes how an ecosystem organizes itself and how it responds to its surroundings. Resilience is the best tactic to adapt in fluctuating circumstances while conserving or regaining functionality and liveliness in states of tension and interruption. Nature demonstrates that disruptions will continuously arise, and that only those tangible or intangible materials, methods, or systems will survive which are self-generating, preserving their DNA for long-term survival (Fry 53–56).

A similar line of thinking started with my undergraduate thesis, "The Edible Book,"

a research project completed at OCAD University (formerly Ontario College of Art and Design). The aim of this research was to explore and provide a neutral perspective on the effects of vegetarian and carnivorous diets on the environment, economy, and personal health, while using design to incorporate senses such as sight, touch, sound, smell and taste. The high rate of chronic diseases, environmental crises, and the ongoing struggle to obtain food that is essential to life led me to discuss relevant information to solve these problems. "The Edible Book" offers a wide perspective that would help sustain healthier diets and a healthier planet. The book is not based on a narrowly focused set of beliefs or habits, but on a cross-cultural comparison of the eating patterns of vegetarians and omnivores. The book encourages you to balance physical activity, mental stability, emotional balance, and spiritual health with a proper choice of diet in order to achieve a stable life. This book educates the reader to be conscientious about food consumption, current health issues, and our

The Edible Book



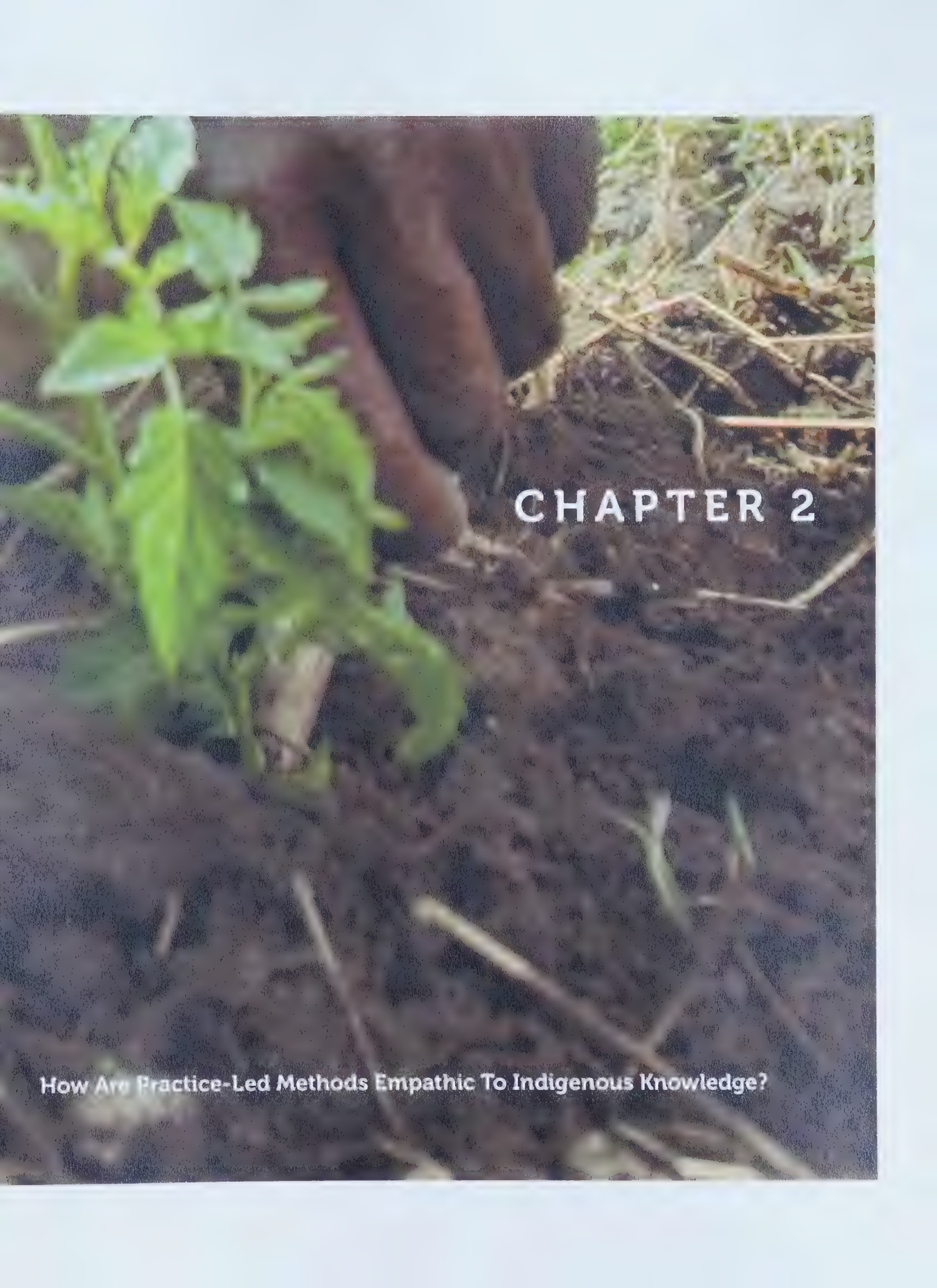




environment and its creatures and to gain a clear perspective of the risks and benefits associated with vegetarian and carnivorous diets. The book was printed on cotton and rice paper, which is entirely edible and biodegradable. Once you have finished reading the book you can eat it—it has a sweet taste—or throw it in your backyard for biodegradation; it will compost within a week. "The Edible Book" was created to account for the entire lifecycle of a product offering an invitation to a more holistic and applicable view of sustainable design, also known as designing for resilience

Resilience building is perhaps the most fascinating skill that life can teach us, in concordance with the nine laws, strategies and principles of nature summarized by Janine Benyus in her book "Biomimicry Innovation Inspired by Nature." She refers to the hidden or embedded knowledge within individual things, be it material or people, to view the wholeness of the entire fabric of life as it narrates the processes of thinking, problem solving, and creating. For professional designers, there is an increasing need to cross traditional disciplinary and institutional boundaries but it can be easy to lose sight of the tacit/procedural knowledge that we bring to each others use. As we share methods and tools among disciplines and observe and react to impactful environmental changes, it is essential to be conscious of tacit/procedural knowledge in order to be resilient, adaptable, and transformative for future generations





CHAPTER 2

How Are Practice-Led Methods Empathic To Indigenous Knowledge?

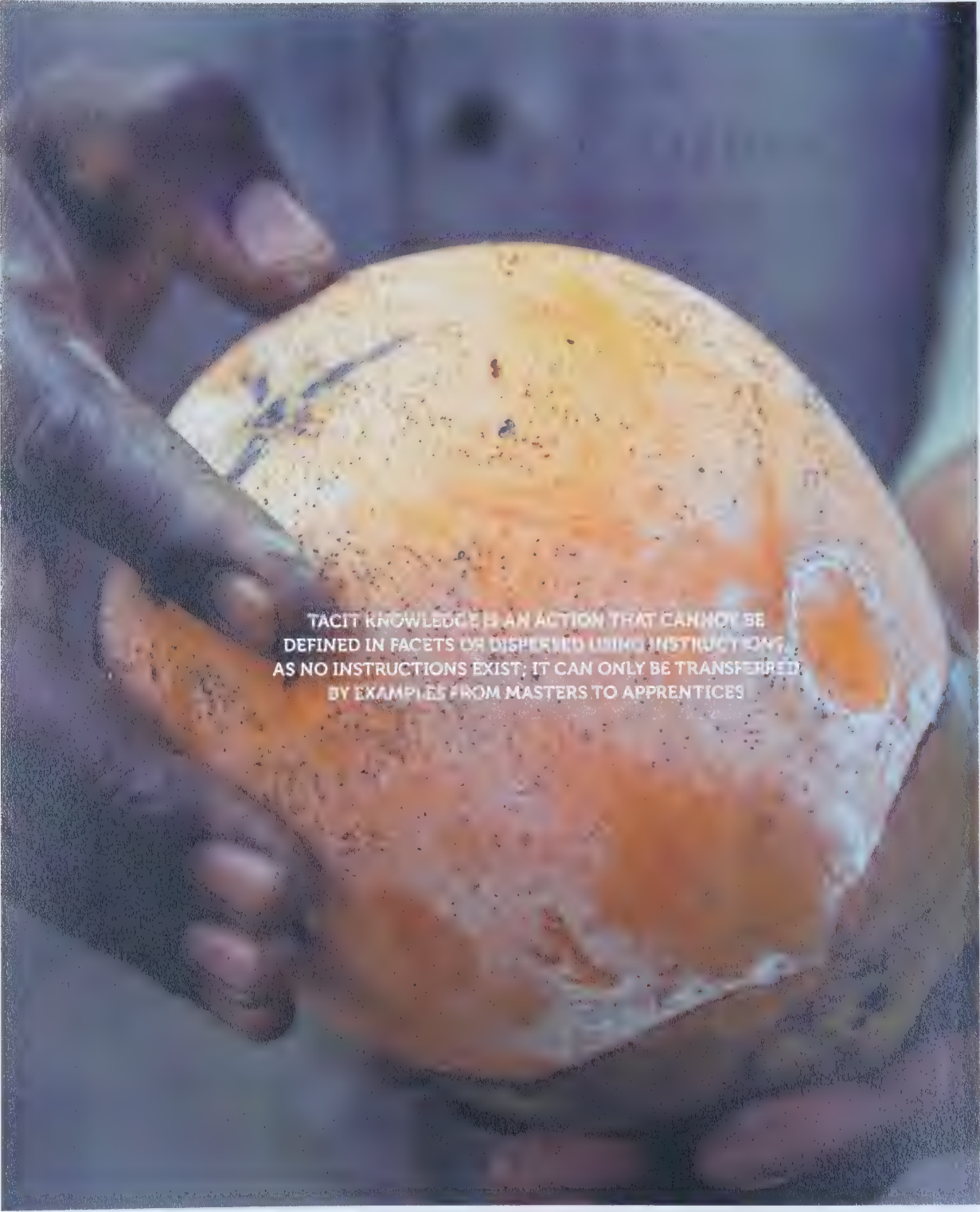
The proposed question, “how are practice-led methods empathic to indigenous knowledge?” has inspired practice-led disciplines such as design to define specific types of formations of knowledge in various fields of practice. These fields include practical, experiential, personal, or tacit knowledge (Polanyi 49), which coincide with and fit into the spectrum of propositional knowledge, also known as explicit knowledge. In order to properly explore the proposed question, it is important to first dissect the concepts of explicit and tacit knowledge. Both these concepts

have something inside that are the same, which allows for empathy to be created between indigenous knowledge and practice-led methods.

2.2 WHAT IS TACIT KNOWLEDGE?

Procedural knowledge, also known as tacit knowledge, according to Sternberg, refers to possessing a talent or a skill and knowing how to use that skill but having difficulty expressing it in words (Bunnin 38). Explicit knowledge refers to assertions that one makes to verify or falsify, and is used as a means to verify that something is one way or the other. Creative and practice-led disciplines employ various terms that hold imperative distinctions within their specific fields to describe non-propositional knowledge; practical knowledge, skills knowledge, process knowledge, personal knowledge, implicit knowledge, professional knowledge, situational knowledge, controlled knowledge, complex knowledge, conventional

knowledge, cognitive knowledge, codified knowledge, public knowledge and experiential knowledge (Polanyi 69-70) are all descriptors of tacit knowledge. It is highly personal, hard to formalize and difficult to communicate to others. The challenge is to identify which elements of tacit knowledge can be captured and made explicit—while accepting that some tacit knowledge just cannot be captured, such as tacit/procedural knowledge. Thus, tacit/procedural knowledge is an action that cannot be defined in facets or disseminated using instructions, as no instructions exist; it can only be transferred by examples from masters to apprentices (Polanyi 49). This research will contextualize connoisseurship—an aspect of tacit/procedural knowledge ingrained in creative and practice-led disciplines. Tacit/procedural knowledge is an element of tacit knowledge which I am interested in capturing and making explicit using the proposed sensorial methodology. To do this a segment of society is looked at where the formation and dissemination of connoisseurship was possible: indigenous



TACIT KNOWLEDGE IS AN ACTION THAT CANNOT BE
DEFINED IN FACETS OR DISPERSED USING INSTRUCTIONS,
AS NO INSTRUCTIONS EXIST; IT CAN ONLY BE TRANSFERRED
BY EXAMPLE FROM MASTERS TO APPRENTICES

A photograph of a garden scene. In the foreground, several green, leafy plants, possibly tomatoes, are growing in dark, rich soil. The plants are in various stages of growth. In the background, a traditional thatched roof of a building is visible, made of dried grass or straw, with some long, thin leaves hanging down from the edge. The overall scene is outdoors and appears to be a rural or agricultural setting.

TACIT KNOWLEDGE IS MOLDED WITHIN THE RESEARCH PROCESS
AS A FRAGMENT OF THE RESEARCH ITSELF. THEREFORE, TACIT
KNOWLEDGE IS KNOWLEDGE THAT AN INDIVIDUAL HAS BUT
CANNOT EXPRESS IN WORDS.

people. They have sophisticated arrays of knowledge that help illuminate why tacit methods of practice remain tacit and how one might make them explicit

The applicability of practical knowledge is examined by exploring the definition and understanding of tacit/procedural knowledge. Michael Polanyi, a chemical engineer turned philosopher, coined the term “tacit knowledge.” He believed that tacit knowledge was a byproduct of the subliminal mind, a database of thoughts, actions, or largely hidden knowledge, based on one’s emotions, experience, insights, intuitions, and observations that makes us act and do things in a certain way that is not yet registered in the conscience mind to be explained or documented (69–70).

Tacit/procedural knowledge is not something that can be elucidated through linguistics or mathematics, as its obscure charisma can only be captured during action. The connection of one person or thing to another that compels some sort of interaction between the two and imparts tacit/procedural knowledge from one to the other, such as learning by doing, is an example of tacit/procedural knowledge (Polanyi 49–53). The following is an example of design chosen from literature based on its description of the apprehensions around tacit/procedural knowledge and proficiencies in the context of practice.

EXAMPLE 2.2.1:

A Canadian research laboratory successfully crafted a tea-laser in the 1960s. The British researchers were asked to replicate the laser; however, the lack of presence and

personal engagement from the original inventors of the tea-laser prevented British researchers from replicating it successfully. The study also disclosed that tacit/procedural knowledge is only transferred between experts and learners after an extended period of time and, even then, learners were unaware of whether they had acquired the tacit/procedural knowledge until they tried it for themselves (Collins 42).



Despite continued attempts by British researchers the replication process was unsuccessful until interaction between the British researchers and the original creators of the laser took place. Based on this example, tacit/procedural knowledge is molded within the research process as a fragment of the research itself. Therefore, tacit/procedural knowledge is knowledge that an individual has but is unaware of it. Nonetheless, this example of the inclusion of tacit character in the research process fortifies the fabrication of our attempts, be they through knowledge claims or technologies. This is not to say that all aspects of tacit knowledge cannot be made explicit. For instance, the example above demonstrates how step-by-step instructions, a component of tacit knowledge made explicit, were provided as part of the process to build the tea-laser.





However, guidance for ensuring its quality, functionality, and durability, such as the instructions for guiding how well the tea-laser was built, could not be provided. This is the same distinction Gilbert Ryle made between “knowing that” and “knowing how” in “The Concept of Mind” (Faurot 27–31). There is a distinction between knowing how to do something versus knowing how to do something well, as noted by Jerry Fodor in “The Appeal of Tacit Knowledge” (70). Here the use of the verb “well” would represent the connoisseur—an aspect of tacit/procedural knowledge ingrained in creative and practice-led disciplines, according to Polanyi (54). The following example chosen from literature illustrates tacit/procedural knowledge based on connoisseurship.

EXAMPLE 2.2.2:

The extensive differentiation of the musical soundings in which one pianist interacts with his piano and the melody produced can differ greatly from the next pianist. So how would one conceivably conduct a proportional analysis between two pianists, if “touch” eludes scientific measurement and analysis to begin with? Through years of experience and training, a great pianist would be able to make very fine qualitative distinctions that surpass scientific measurements and do not fit into a measurable grading scheme (Polanyi 54). This raises a question: can connoisseurship be redeemed and viewed on the same level of expertise as a person with a doctorate, and does that presumably qualify connoisseurs to become supervisors or examiners in practice-led doctoral programs? As Polanyi would say, unknown rules “as such” are still rules (55).

A connoisseur knows the rules and can communicate them through forms of gestural interaction, which is an unconventional style of propositional knowledge. As a result this knowledge is excluded from classification as research even though it is a form of knowledge creation.

From the examples of 2.2.1, we see how explicit knowledge encompasses a component of tacit knowledge and vice versa. Both concepts overlay each other for explicit knowledge to become evocative and for tacit knowledge to become communicable. Expertise and connoisseurship in research, as well as communicating and applying the process for creating new experiences and knowledge creation within research, hold great benefits. However, tacit/procedural knowledge eludes communicability as a means of verification.

Before the importance of preferred insertions of tacit/procedural knowledge within design research can be determined, it is vital to further investigate the format of tacit/procedural knowledge within an indigenous context to help illuminate why methods of practice within practice-led disciplines remain tacit. We should also ask how one might make tacit/procedural knowledge explicit by using indigenous ways of knowing and documenting, and how to use indigenous methods of verifying tacit/procedural knowledge.

2.3 INDIGENOUS KNOWLEDGE IS A FORM OF TACIT KNOWLEDGE

In the ideal world, knowledge would be accessible to everybody. However, according to Rosenberg, indigenous knowledge is concentrated in certain cultures, localities, and societies. It is entrenched in community practices, institutions, relationships, and rituals. As such, knowledge forms the foundations for decision-making in agriculture, healthcare, food preparation, education, natural resource management and a host of other activities from an indigenous perspective (Dei 18). Similar to the characteristics of tacit knowledge, the characteristics of indigenous knowledge are defined as personal, oral transmission, experiential, and holistic. To illustrate

CHARACTERISTICS OF INDIGENOUS KNOWLEDGE

HOLISTIC: Openness to intuitive or spiritual insights. Ceremonies help to instill this character of openness to create full awareness. This knowledge is transferred using a narrative or metaphorical language conveyed by elders in the form of symbols (Lavallée 28).

PERSONAL: What one knows has been repeated frequently enough to have gained a place in current oral culture; its relevancy and source cannot be verified, it is merely what one knows (Lavallée 28)

EXPERIENTIAL: Both experience and trial-and-error tests in the harsh laboratory of survival of local communities endlessly strengthen indigenous knowledge (Lavallée 28)

ORAL TRANSMISSION: The imitation and demonstration of knowledge, and also referred to as preliterate. Elders considered literacy a ritual of communication far more progressive on an evolutionary gamut, and have a responsibility to deem whether the learner is ready to use the knowledge responsibly, since certain knowledge will lead to one's self-demise (Lavallée 28)

Essentially, indigenous knowledge is a form of tacit knowledge that is not easily codified. In the realm of indigenous knowledge there are various definitions of the concept. Indigenous knowledge is the information bank for a culture that facilitates communication and decision making (Flavier 479). Indigenous information structures are self-motivated and are constantly influenced by internal creativity and experimentation as well as by contact with external systems (Ibid). The definition refers to indigenous peoples' intellectual inheritances as a result of their collaboration with nature, made on a day-to-day basis and gained over centuries, on a terrain of emotions, experience, insights, intuitions, and observations. This form of knowledge conveys the proficiencies, priorities, and valued methods and techniques of local indigenous people and their communities (Dei 19–20).

Marlene Brandt-Castellano, an indigenous scholar, classifies indigenous knowledge as a root of various sources such as traditional teachings, empirical observation, and revelation, where revelation is further subdivided to include dreams, visions, cellular memories and intuition (Steinhauer 74). To elaborate, Cajete, Cardinal, and Haldebrandt hint at myths and philosophies found within indigenous cultures to introduce dreams, prayers, and ceremonial rituals as the keys to unlocking the energy within oneself (Cajete 2). This is a form of indigenous knowledge that immortalizes personal transformation and self-discipline, and teaches how one should live to sustain a healthy livelihood. Dr. John Denninger, a psychiatrist at Harvard Medical School, has conducted studies on how indigenous

practices such as meditation affect genes and brain activity. Proper meditation techniques are learned over many years of dedication and practice through insights that cannot be put into words nor explained through symbols, as no such media exists to relay the final state of meditation.

Social anthropologists have studied indigenous practices and knowledge systems extensively, but only from an ethnological or social perspective and not from a statistically substantive perspective. This likely stems from the paucity of literature on local indigenous knowledge transfer between communities and cultures. There are only a few indications of indigenous knowledge transfer from traditional civilizations to industrial countries. For example, herbal medicine is the foundation for allopathic medicine (Chopra 1–2). Herbal medicine is a worthy paradigm for indigenous knowledge transferred in the form of a narrative from person to person as a result of careful observations and experimentations. Medicinal plants are the earliest known health care products that have been used by mankind. Over three-quarters of the world's population still rely on the use of traditional medicines for their primary health care needs. Medicinal plants are a major component in the formulations used in indigenous systems of medicine, but are also strongly prevalent in many allopathic drugs. One of the earliest references to the medicinal properties of plants is in Ayurveda (3500–1800 BC).

Ayurveda is an ancient Indian system of medicine based on the medical properties of plants (Chopra 1–15).

To illustrate, "*Ocimum Tenuiflorum*" (Holy Basil leaves), lemon, turmeric, and ginger are used as alternatives to allopathic medicine to cure colds, coughs, headaches, or asthmatic attacks (Chopra 1–2). The following example demonstrates how tacit character can be made explicit

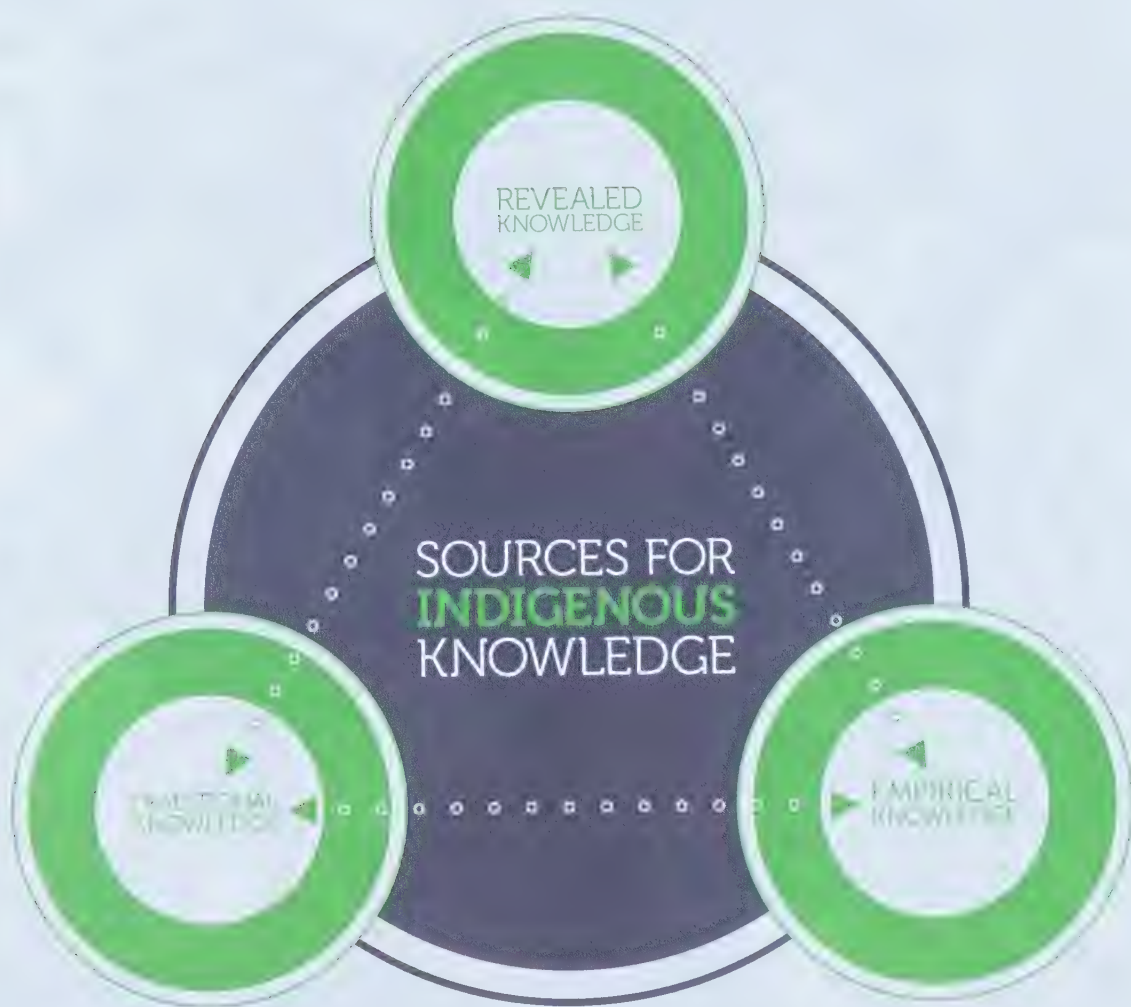
EXAMPLE 2.3.1



In many remote indigenous regions of India, there is no access to medical facilities. In such cases, patient would frequent Hakims. A Hakim is a physician who uses conventional medicines in the field of ethno-medicine in Indian and Muslim countries. For instance, if a villager caught malaria, a Hakim would be called to treat him. The patient would be provided with a "Muvangi" (marigold) plant. This plant would be boiled and the steam inhaled by the patient, and also cloth would be dipped into the hot water and massaged onto the patient's body. This process would be repeated twice a day,







and in the following few days the patient would be cured (Chopra 1-2). The boiling, dipping, massaging, and inhaling are all parts of tacit knowledge gained over years of experience through insight, intuitions, and observations which are then made explicit (William 140).

Determining which herb is used to treat which illness, including the quality and identification of the herb by its manifestation or tactility is a characteristic of tacit/procedural knowledge which has been shaped within the investigative process as a portion of the research.

SOURCES FOR INDIGENOUS KNOWLEDGE

There are various categories of knowledge that create the structure of indigenous knowledge. It is important to understand these categories and the sources from which indigenous knowledge originates. Many of the categories intertwine and rely on each other to achieve the essence of indigenous knowledge. Indigenous knowledge is shaped within the investigative process. These categories will be explored below.

TRADITIONAL KNOWLEDGE:

Knowledge inherited from the previous generation that varies slightly by geographical location and is situated in specific communities that lie within the borders of cultural traditions. These cultural traditions are a set of skills engendered by natives living in those communities (Dei 25–31). Traditional knowledge encompasses information explaining our origin and the creation of the earth. Whimsical, heroic, or cautionary tales, values, beliefs and morals would be passed down from generation to generation by elders and would provide the foundation for a civil society. It also passes on chronicles in the forms of narratives for land claims, genealogical records of ancestral territory, memorialized battles, boundaries, and treaties, while engendering

feelings of caution or trust concerning adjacent nations. In essence, it is knowledge embedded in the minds and bodies of its practitioners and signifies connoisseurship, which is a characteristics of tacit/procedural knowledge (Polanyi 49).

EMPIRICAL KNOWLEDGE:

Knowledge acquired through meticulous observation of the ecosystem is considered empirical knowledge. Observations of patterns within the ecosystem made by indigenous people over an extended period of time helps craft this knowledge. It is knowledge that evades the parameters of theoretical knowledge. Trial and error examined in the arduous circumstances of survival, helps to shape the experience formed over generations to verify its credibility (Dei 25–31). Revisions, modifications, additions and subtractions of information are made as the observations are passed down, and as the next generation observes change.

Waldram provides examples of indigenous science alongside analysis of certified Western academic practices challenged by indigenous understanding. The results show that the indigenous conclusions have far more credibility. As Waldram





explains, the theories developed around indigenous knowledge were not based on quantitative analysis, and cannot be repeated in a controlled environment with controlled parameters (Waldram 115–124). Here connoisseurship is predominantly reflected through observation, again a form of tacit/procedural knowledge (Please see Appendix 1)

REVEALED KNOWLEDGE

Spiritual knowledge in nature, grasped through dreams, visions, and intuitions, are all stated as spiritual in source, whereas perception is understood to include a form of experiential insight (Dei 24). "In Maps and Dreams," by Hugh Brody, the reader is exposed to the concept of receiving a skill in the form of a gift through dreams. Similarly, indigenous people made use of their dreams and replicated them in real life. For example, once a dream was had, the dreamer would replicate what had been learned to follow the path, locate the prey, and make the kill (44). The tacit character here involves emotions, insights and intuitions but also observations and experiences. As stated by Polanyi, tacit/procedural knowledge is not something that can be elucidated by linguistics or mathematics, it can only be captured through action such as learning by doing (Polanyi 49–53). Therefore, the hunter would gain the tacit/procedural knowledge once he actually went out and hunted, applying what he had learned subliminally. This would later be passed down to the next generation in the form of a narrative.

The above categories exemplify timeless truths, which may need to be adapted in order for knowledge to maintain its

effectiveness with the current generation. Indigenous knowledge is the production, reproduction, discovery, and evasion of knowledge due to perceptions made by different individuals. It is a form of knowledge that is somewhat static, but adaptable to change (Dei 25–31). This is passed on through continual teaching and adapting to change by the elders in light of present times, the available resources, and the need to make the knowledge applicable to each generation (Dei 23–24). Elders are actively involved in the economic, social, and political life of their communities, which allows them to sustain the validity of indigenous knowledge. Elders hold a position of great importance in the indigenous communities, as they are the ones who embody wisdom, and pass the credo to the next generation. Researchers who decide to conduct research in indigenous communities need to incorporate elders as active advisers. In Toronto, for example, the Kaadinakijik Council provides guidance for the community and seeks the advice of elders prior to starting any research in indigenous environments (Lavallée 27). Elders are often thought of as the gatekeepers of indigenous knowledge.

INDIGENOUS RESEARCH FRAMEWORK

An example of an indigenous research framework can be seen in Kovach's doctoral study. She employs tribal epistemology to come up with a unique methodology unlike any other qualitative approach employed in Western research. To your right is her indigenous research framework encompassing Nehiyam (Plains Cree-traditions) epistemology (Kovach 44).

- **RESEARCHER PREPARATION**
(tribal epistemology)
- **RESEARCH PREPARATION**
(decolonizing and ethical aim)
- **DECOLONIZING & ETHICS**
(researcher preparations involving cultural protocols)
- **GATHERING KNOWLEDGE**
(research preparation involving standard research design)
- **MAKING MEANING**
(of knowledge gathered)
- **GIVING BACK**

Kovach's methodology is based upon several key qualities of the Plains Cree traditions, which include:

- ▶ (a) holistic epistemology
- ▶ (b) story
- ▶ (c) purpose
- ▶ (d) the experiential
- ▶ (e) tribal ethics
- ▶ (f) tribal ways of gaining knowledge
- ▶ (g) an overall consideration of the colonial relationship (Kovach 44).

By modifying qualitative Western research methods through the lens of indigenous ways of knowing, Kovach was able to explain the sources of indigenous knowledge that made up tacit knowledge, as opposed to explicit knowledge. This manifests itself as a conceptual model that allows for certain components of tacit knowledge to be made explicit and new knowledge to surface (Smith 123–37).

EXTRACTION OF INDIGENOUS KNOWLEDGE?

Indigenous knowledge is made readily communicable between members of the indigenous community, since it is a part of their daily lives. It was found that sharing indigenous knowledge outside the boundaries of a specific indigenous tribe is not something which happens too often. Indigenous knowledge is largely entrenched in practices and experiences; it is usually shared through personal communication and one-to-one interactions such as master to apprentice, parent to child, and neighbor to neighbor. This transfer of knowledge does not lend itself to broad distribution outside of the tribe (Unknown 6–9).

An exchange of knowledge between a provider and a recipient is far easier to accomplish if both share a common

THE WOMAN WHO CAME BACK



AN EXAMPLE OF DOCUMENTATION OF INDIGENOUS KNOWLEDGE USING ANIMATED METHODS OF NARRATION.

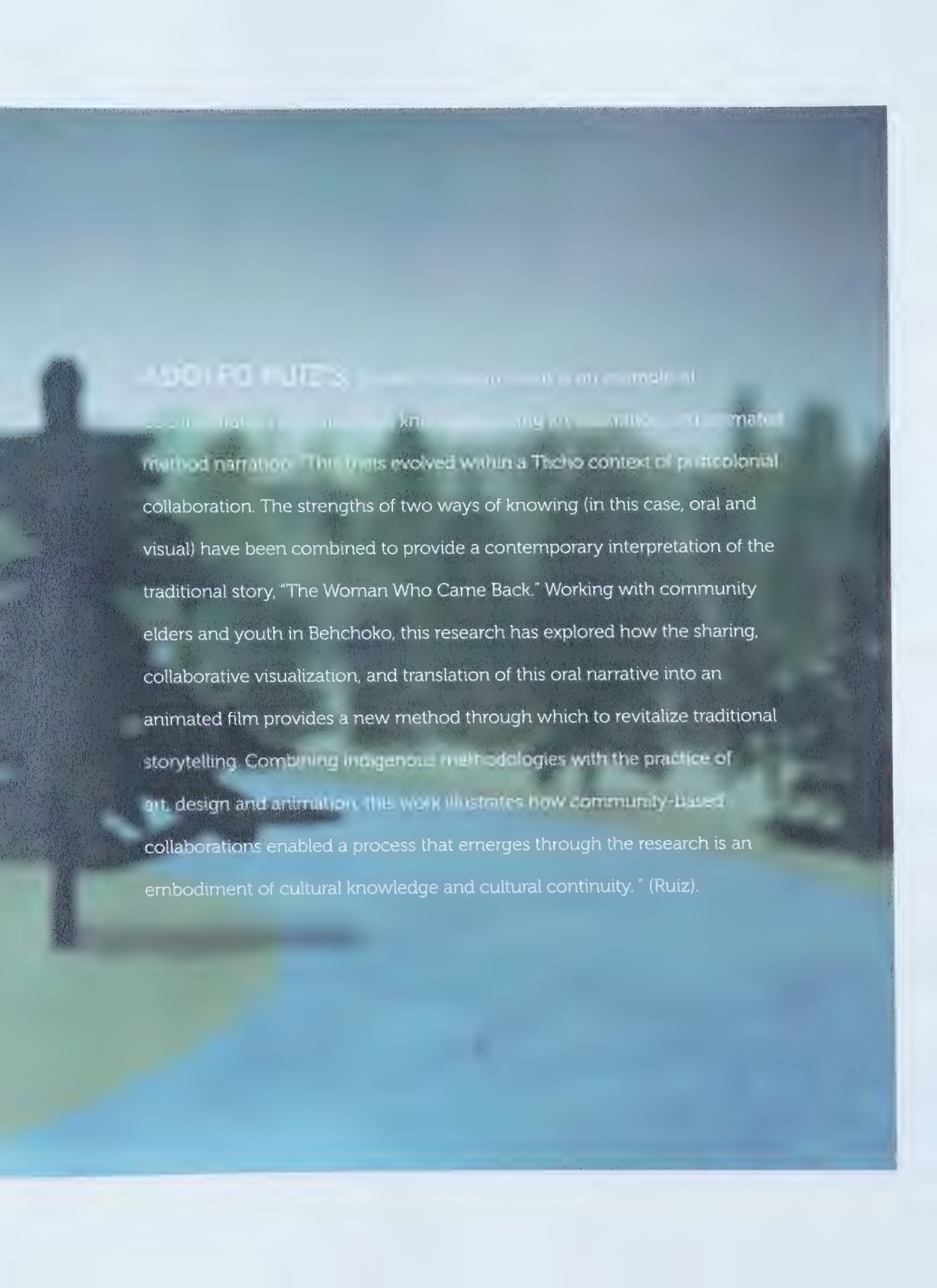


language and fundamental cultural notions. Yet certain facets of tacit knowledge within indigenous knowledge are surely capable of becoming explicit knowledge, as was illustrated in the example of the use of herbal medicine. Keeping in mind the tacit nature of indigenous knowledge, one could use audio-visual technology, taped or filmed narration, drawings, databases of experts in relation to their expertise, indigenous advisory boards similar to the Kaadinakijik Council in Toronto, or other forms of codifying information to document indigenous knowledge. Similarly, the following example shows how social researchers have made use of local indigenous knowledge to alleviate the problem of iron deficiency in Cambodia.

EXAMPLE 2.3.2

According to Armstrong, iron deficiency impairs cognitive development and results in anemia and weakness. Gavin R. Armstrong, a Ph.D. candidate from the University of Guelph, took the initiative to start a project by the name of "The Lucky Iron Fish." The author of this study suggests about 315 million people are said to be suffering from iron deficiency in Southeast Asia. This project utilized available indigenous knowledge to alleviate the problem of iron deficiency starting with the local villages in Cambodia. Through investigation, Armstrong found that indigenous people cooked their food in iron pots; this allowed for the slow leaching of iron into the boiling water that prevented one from becoming deficient in iron. Using such information, Armstrong designed an iron fish made from scrap metal by local metal workers that was applied to the boiling water at the time of





ADDI PO RUIZ'S research process is an embodied
collaboration between indigenous knowledge and animation and animated
method narration. This takes evolved within a Tschol context of postcolonial
collaboration. The strengths of two ways of knowing (in this case, oral and
visual) have been combined to provide a contemporary interpretation of the
traditional story, "The Woman Who Came Back." Working with community
elders and youth in Behchoko, this research has explored how the sharing,
collaborative visualization, and translation of this oral narrative into an
animated film provides a new method through which to revitalize traditional
storytelling. Combining indigenous methodologies with the practice of
art, design and animation, this work illustrates how community-based
collaborations enabled a process that emerges through the research is an
embodiment of cultural knowledge and cultural continuity." (Ruiz).

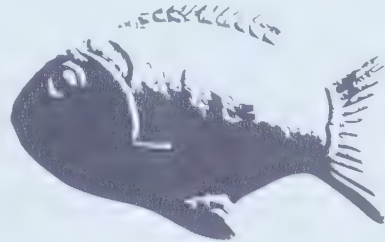


preparing food to boost levels of iron in it. The results from a nine-month pilot project showed restored levels of iron in women and reduced anemia by half. At the start of the study, Armstrong only provided a lump of iron to be placed in the water, but the villagers were hesitant to use this lump of iron. After further investigation, Armstrong found that fish represented one of the national symbols of Cambodia: Cambodian people considered the fish to be lucky, hence the name **"The Lucky Iron Fish"** (Armstrong)

Similar to the example of the use of herbal medicine, the above example addresses the importance of the transfer of indigenous knowledge through documentation to allow for mass distribution. As a type of tacit knowledge, it still holds great significance for individuals with iron deficiency in an urban environment where Western medicine may not provide sufficient results. This tacit knowledge of using iron pots or putting lumps of iron in the water at the time of cooking is something that would have been passed on through the generations. This and many other types of tacit knowledge are waiting to be unlocked from indigenous cultures by researchers like Armstrong. This knowledge is not limited only to local people, who are the source of the knowledge; such knowledge can also be used by individuals in developed countries. Iron deficiency is not an uncommon problem in developed countries, and as opposed to using iron supplements or iron injections, we can encourage the use of "The Lucky Iron Fish." The latter option is more economical, as well as scientifically proven to hold the same or better results as compared to iron

supplements or iron injections. Relating the above example to the concept of design and the importance it has play here, it essential to note the shape of the iron used by Armstrong. He designed a lump of iron to represent a national symbol of Cambodia; as a result the local indigenous people where able to relate to the symbol and therefore its use was encouraged

The following section further investigates the format of tacit knowledge to create a discourse on the nature of practice-led methods to exhibit a tacit character. This alludes to an understanding of how tacit knowledge can be employed in the research process



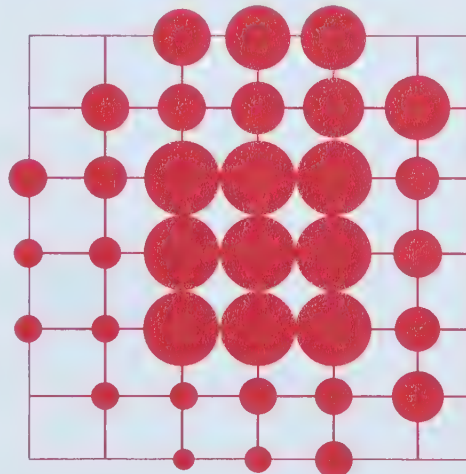
2.4 PRACTICE-LED METHODS ARE A FORM OF TACIT/PROCEDURAL KNOWLEDGE

This section is based on the ongoing investigation of why non-propositional content remains tacit in what has been called practice-led research in design. Two questions are worth noting here: What are practice-led methods? How are practice-led methods a form of tacit/procedural knowledge?

Similar to other disciplines, it is essential to maintain a continuous attempt to facilitate a platform for making knowledge communicable through design. Research that relies on practice as its predominant focus is referred to as practice-led and practice-based research. Practitioners, such as artists, designers, curators, writers, musicians, and teachers conduct practice-led and practice-based research. Practice-led research is concerned with the procedures of the practice, whereas practice-based research is concerned with the knowledge gained from the finished artifact (Frayling 5).

Practice-led research reflects on the methods of practice that are embedded in the design process as a fragment of the research itself (Frayling 5). Hence practice-led research helps to contextualize the tacit aspect of procedural knowledge as a means to make the creative process somewhat transparent. In other words, it is about making the tacit component explicit, so that the expertise and connoisseurship are made communicable. Essentially, it is about knowledge that practitioners have but are unaware of because it is a part of

their subliminal consciousness. Practice-led research is about someone performing the action, as explained by Polanyi, using the concept of focal and subsidiary awareness. For instance, focal awareness is responsiveness while operating a vehicle on the road, as well as the determining the direction of travel. Whereas subsidiary awareness means not always being entirely aware of every single action leading to braking, accelerating, gear shifting, and related actions (55). The example of driving highlights subliminal actions as the controller, while practice-led research propagates creativity through deliberate actions. Practice-led research attempts to shed light on the nature of the practice so that it can be improved to accommodate a world of constant change in economical, environmental, and health fields to promote resilience in design (Cross 54-56). Coumans explains practice-led research as follows:



Practice-led research is focused on the rhetoric research direction precluding from the ideations realm to the production realm . . . an articulation of the methods being used in the design process, in which the designers must justify the choices made, therefore verifying the knowledge being used or searched (65–66).





Williams argues that we should consider a concept to be knowledge if it can be documented and verified (Polanyi 53). Practice-led research is a non-subliminal interpretive engagement with the design process and an examination of conscious methods of design in the making of the artifact (Scrivener 71). This might completely evade the serendipitous nature of the practice of art and design since research requires conscious scrutiny to verify and transfer knowledge. However, it is vital for the tacit/procedural knowledge? component of design methods to be made explicit. It must be tested in various parameters, including environmental, economical, technical, and social dimensions. This could help demonstrate the same credibility and degree of confidence as other academic disciplines such as linguistics or mathematics (Cross 54–56). This research builds a platform for exploration so that the practical and reflective parts inspire and learn to hold a dialogue with practice.

According to Scrivener, in the design methods both experience and feelings need to be captured, whether in visual or textual format, so that what the practitioner learns from within his practice becomes explicit, assessable, and communicable (71). For example, with visual or textual objects like diaries, photographs, or film the intermediate stages could become raw data to be used as research material for critical assessment. Therefore, the design process can be treated as reflection on-action and gestures as these occur or shortly thereafter for documentary processes, through visual or textual entities to identify how the practitioner performs

DOCUMENTATION

Documentation is fundamental to practice-led research. When the design is put into action it needs to be accessible as verification for practice-led research. Research claims for accreditation by university and national research bodies require documentation to support the research claims found through design practice (Smeyers 479). Williams argues we should consider a concept as knowledge if it can be documented and verified (Polanyi 53). Practice-led research is a form of tacit/procedural knowledge in which every action proceeds from the previous one and informs the next, verifying what is right within and through the actions themselves and their outcome. However, the challenge lies in the definition of practice-led research. The tacit/procedural knowledge that is included in research and which allows designers to draw on tacit/procedural knowledge is embedded in the practice. If practice-based research is essentially tacit/procedural knowledge (Neuweg 45), then how can such knowledge be documented? Essentially, indigenous methods of documentation may help to contextualize and disclose tacit/procedural knowledge found within practice-led research. As previously mentioned, indigenous peoples have relied on ancient practices as a means to elucidate solutions to daily hurdles by drawing from tacit knowledge preserved by their own methods of documentation for communicating, teaching, and coaching

To transfer an interactive process into evidence, indigenous people use concepts like Anishinaabek, the sharing circle, and the medicine wheel to record and document personal experiences orally or textually. The stories, symbols, crafts, artworks, poems and songs are vehicles to deliver tacit knowledge and make it communicable (Unknown 2–4)



• **ANISHINAABEK** (Ojibway, Algonquin peoples), is a symbol-based reflection, including the making of crafts, artwork, poems, or songs, that become a spiritual experience for insight to expression and healing to define and make sense of the ubiquitous domain (Unknown 2–4).

• The **SHARING CIRCLE** is about giving voice to the participants' thoughts by telling everyone their experiences. Holding the stick is a symbol of respect for one's thoughts, stories, and individual experiences of each member participating in the circle (Lavallée 28–29). The objective of the sharing circle is to encompass and share the experiences of indigenous people.

• The **MEDICINE WHEEL** is a symbol and recourse to make sense of things around us. The wheel is fragmented into four sections, which are all interconnected by healing stories, morals, and values. The connections are symbolized physically by a feather placed in the center of the circle to illustrate the interconnectedness of the sections. The wheel works as a teaching tool for lessons of physical, mental, emotional, and spiritual wellness (Lavallée 23–24).

Indigenous methods of research draw on tacit knowledge to incorporate a more holistic and resilient way of life that provide a suitable platform for extracting and documenting tacit knowledge. Similar to indigenous ways of thinking, Polanyi asserts that “to know and to do” are not two isolated actions; they both are experienced in a coalesced manner through the working of our senses (53) embodied knowledge. Tentatively, it can be concluded that the transfer of tacit/procedural knowledge within practical forms or practice-led research consists of the imitation of physical gestures combined with our senses. To elaborate, observant learners will mimic a set of stylistic formulas, as well as formulas unknown to the masters themselves (Polanyi 53). The above can be illustrated through an example of the global corporation **Toyota**:



**EXAMPLE: 2.4.1**

As part of the training program at Toyota, when a new assembly factory is opened, rigorous training practices are put into place to maintain consistency and quality to sustain their product. A core group of two to three hundred new employees are selected and sent as trainees to work in one of Toyota's existing factories for a number of months alongside seasoned Toyota assembly line workers. Here they learn, absorb, and copy a set of formulas unknown to the master himself. Following the training, the employees are sent back to the new factory site, along with one to two hundred highly experienced Toyota workers. These workers will work at the new factory site along with the new employees to affirm that tacit/procedural knowledge is fully implanted in the new factory site. Another approach for transferring tacit/procedural knowledge at Toyota's assembly lines includes an approach found in an indigenous context: the Sharing Circle. Toyota calls it the "Quality Circle," in which at the end of each work week, groups of Toyota production workers spend a couple of hours examining the recital of their part in the production system to pinpoint definite or possible glitches in quality or productivity. Finally, each group shares this information with other groups, as would be done in the indigenous community of the Sharing Circle (Spear and Bowen 97–106). This transfer of tacit/procedural knowledge helps to solidify and ensure that Toyota maintains their product quality.



The example 2.4.1 highlights that by observing the gestures of the master and imitating the action preformed, the learner harvests the rubrics of production and attains tacit/procedural knowledge. An analysis of the methods of practice is made through the documentation of physical gestures, whether textual or visual. Similar to indigenous ways of documenting, we can create prototypes as a way of recording the actions of the master, such as a written diary, sketchbook, voice recording, photography or film, to document the various stages of the design process. However, this process is incomplete without methods of documenting the tactility of entities, such as the materials involved.

Similarly, the sharing circle encompasses both sharing intangible experiences and tangible materials in the form of symbols to create guidelines for doing things a certain way and to help reference indigenous ways of documenting (Lavallee 28–29). This would lead to an empathic understanding of the materials or subject involved. To have a common feeling or language associated with a material or color is very important in design. For example, color is of great importance in branding, hence the “Pantone Colour Guide” was developed to preserve the visual consistency of a brand, regardless of the geographical location. Likewise, as designers we can collect samples of materials with written, verbal, or filmed descriptions referring to the feelings stirred within the designer at the time of touching and manipulating the materials. This helps compare and

test the various emotions felt through the tactility of the material, in order to verify the knowledge gained by the designer. These methods of documentation are merely examples, which are yet to be tested and implemented. Further research is needed to test and establish appropriate methods, inspired by indigenous ways of life, to extract and store tacit/procedural knowledge and to adhere to a more broadly structured process that will help achieve an understanding of the role and format of tacit/procedural knowledge in practice-led research.

This chapter has discussed how practice-led methods are empathic to indigenous knowledge. Both indigenous knowledge and practice-led methods exhibit a tacit character in the production of knowledge, which allows for empathy to be created between them. A fundamental discourse around the format and type of knowledge found within practice-led research to extract and communicate tacit/procedural knowledge has been modeled to allow practice-led methods to achieve the same degree of academic credibility as non-creative disciplines.

In the following chapter, you will find a framework for the proposed sensorial methodologies, which have yet to be tested in a controlled environment, to achieve the extraction and documentation of tacit/procedural knowledge entrenched within the methods of practice. These methodologies could collectively germinate new, adaptive practice-led methods of design to allow for the accommodation of some foreseeable hindrances, such as the scarcity of resources, and potentially address design for resilience.

An abstract, hand-drawn red line drawing consisting of multiple overlapping, elongated, and somewhat circular loops. The lines are thin and fluid, creating a complex, tangled web of shapes that fill most of the page. The overall effect is one of organic, chaotic movement.

THE TRANSFER OF TACIT KNOWLEDGE CONSISTS
OF THE IMITATION OF PHYSICAL GESTURES

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DIABETES

Populations consuming vegetarian and semi vegetarian diets have lower rates of chronic diseases that typically plague Western countries. Research strongly supports that vegetarianism promotes health and wellness, preventing chronic diseases. The famous saying "You are what you eat" goes around concerning diet is truly applicable in this instance. We senselessly kill animals for food and, in turn the

consumption of their flesh can lead to illness. Further more North America is the number one and number two Killers of people due to their dietary lifestyle habits. Vegetarians diet is a help to many people.

1000 deaths each year. More than 100,000 Americans whose deaths are attributed to the symptoms of heart disease, and there are large numbers of other people who are as yet undiagnosed. It has been estimated that coronary heart disease costs the government more than \$40 billion a year. An improvement in risk factors should mean less heart disease. One recently completed study carried out over a 20-year period showed that meat consumption was associated with higher incidence of heart attack in both men and women. Elaborate statistical analyses indicated that these effects were not due to differences in eating habits between vegetarians and non-vegetarians, nor were they due to differences in the consumption of other foods besides meat and

CHAPTER 3

Making Tacit Knowledge Explicit in Practice-led Research

Designers in the modern age have been exposed to the teaching of explicit knowledge, and there have been very few pedagogic frameworks made accessible for designers in areas of contextualizing connoisseurship a tacit aspect of procedural knowledge ingrained in creative and practice-led disciplines; for the purpose of making it communicable. This thought is not just limited to the creative fields. For example, as mentioned in the previous chapter, connoisseurship an aspect of tacit/procedural knowledge is knowledge that even the master does not know that

he or she has as this knowledge is slowly obtained by collecting all of those things that we know how to do but perhaps do not know how to explain. Furthermore, without having methods for extracting and documenting this knowledge, it is forever lost. Therefore, this chapter will explore the development of proposed sensorial methodology for eliciting tacit/procedural knowledge. It reveals methods for unlocking the embedded knowledge of people by employing our senses as a form of methodology. This could help analyze one's methods of practice, which can then be taken as evidence relevant to achieving the same degree of academic credibility as other naturally measurable disciplines. From this, researchers can gain an understanding of how practice-led research could be carried out with quantifiable outcomes.

perceived by the body. Senses are divided into two groups: the exteroceptors and the interoceptors. Exteroceptors detect stimulation from the outer shell of our bodies, such as, smell, taste, and balance. Interoceptors detect stimulation from the inside of our bodies, such as blood pressure dropping or change in glucose and pH levels. The way that the brain decodes the stimuli being received will vary according to the senses of different people. For instance, taste that is pleasing to one person could taste awful to another, and the same goes for smell (Bossomaier 10–15; Johnson 6–7). As we grow up, we are taught about the five senses. For the purpose of developing a speculative sensorial methodology the following senses are described separately:

3.2 WHAT ARE SENSES?

Senses help us to experience reality, allowing stimuli external to the body to be



VISION: Vision is the work of the eyes and the brain to process any

information seen by the eyes. Upon seeing, visual information is sent to the brain by way of nerve impulses, and this is where the brain processes the information. About one-third of the information seen by the eyes is processed in the cerebral cortex of the brain (Bossomaier 32–34; Johnson 10–15).



TOUCH: Touch is one of the first senses to develop in the womb, and studies have shown that it is the final sense an individual experiences before death. The human body has approximately 50 touch receptors for each square centimeter and five million cells in total, making the skin extremely delicate and the largest, most complex organ in the human body. The receptors are divided into groups, which include mechanoreceptors responsible for detecting pressure, vibration, and slipping; thermoreceptors responsible for detecting change in temperature; and nociceptors responsible for detecting pain (Fulkerson 1–3; Johnson 36–37).



SOUND: The ear gathers and detects sound waves, and it also plays

a significant role in maintaining equilibrium and body position. Found in the inner ear are sensory receptors for both hearing and equilibrium, which are known as mechanoreceptors. The receptors are hair cells that have stereocilia, long microvilli, which make them exceptionally sensitive to mechanical stimulation. (Bossomaier 32–34, Johnson 16–19).



SMELL: Humans receive the sense of smell in the nasopharynx. The nasal passage is covered with a moist epithelium, which acts as a solution in which airborne molecules go. This results in an impulse that is sent to the brain and recorded as a particular smell. An olfactory receptor neuron sends an impulse via the cranial nerve to the olfactory nerve. In fact, 80–90% of what one thinks of as taste is, in reality, due to smell; hence, when we have a cold with blockage in the nose, we experience difficulty tasting our food (Bossomaier 15–19, 32–34, Johnson 26–31).



TASTE: Taste buds transduce the sense of taste in humans and are

born via three of twelve cranial nerves. In cranial nerve VII, the facial nerve, the inner two-thirds of the tongue receive the sensation of taste through the facial nerve, excluding the circumvallate papillae and the soft palate. Cranial nerve IX, the glossopharyngeal nerve in the posterior one-third of the tongue, receives the taste sensation through the glossopharyngeal nerve, which includes the circumvallate papillae. The oral cavities, the pharynx and epiglottis, also receive a branch of taste sensations through the vagus nerve. The gustatory system processes the information received from the above cranial nerves. All taste buds have the ability to react to all types of taste, but there are certain instruments to measure the small variations in sensations between the taste buds. Taste is dispersed across the entire tongue, even to areas of the mouth where there are taste buds, including the epiglottis and soft palate (Bossomaier 15–19, 32–34; Johnson 32–33).

Senses help us to experience reality. As a unit, they deliver to humans a comprehensive perception of space and the things around us (Bossomaier 10–15; Johnson 6–7). Designers always pay attention to color, materials, formation, and so on; however, this only involves the sense of sight and perhaps touch, leaving out other senses such as smell, sound, and taste, which are seldom if ever considered in the design. Ocularcentrism has dominated design, design studies and design teaching for quite some time, such as “The Gestalt Theory.” While sight is an most important sense in design, “The Edible Book” has taught me about the importance of the other senses. These other senses can strengthen visual perception and deliver a distinct design that is easy to decipher, as more than one sense is involved in the explanation and delivery processes of the design. Based on our understanding of sensory formation, the following is proposed a framework for extracting, communicating, and documenting tacit/procedural knowledge within practice-led methods by employing our senses.

3.3 SENSORIAL METHODOLOGY

Connoisseurship a tacit aspect of procedural knowledge works from the premise that it is largely personal in nature and consequently challenging to extract from individuals, as mentioned in Chapter 2. The indigenous ways of disseminating tacit/procedural knowledge have generally been handed down to those working side-by-side with an experienced master of a certain craft. Since many of the indigenous practices have completely evaded the modern lifestyle, it would be safe to assume that the same is true of the practice of passing on tacit/procedural knowledge, resulting in loss of knowledge. To reduce this loss of connoisseurship, it is imperative to store and document tacit/procedural knowledge. As described the outbreaks of my COPD were managed with help of indigenous knowledge. The tacit/procedural component of this knowledge relates to the quality of the “Ocimum Tenuiflorum” (tulasi leaves), also commonly known as Holy Basil leaves, used. The quality can only be determined by an expert’s knowledge through the use of his senses: sight, touch, and taste, as aforementioned by Dr. Dalbir Singh, a

retired agricultural scientist. Therefore, the transmission of tacit/procedural knowledge entails the replication of physical gestures (Polanyi 53). This does not mean that the subliminally obtained and unconsciously used skills cannot be employed to enhance and support scientific and non-scientific knowledge. Nor does it mean that there must be a transfer of knowledge from one person to the other for these skills to be determined as useful. This idea is further explained in the example to the right.

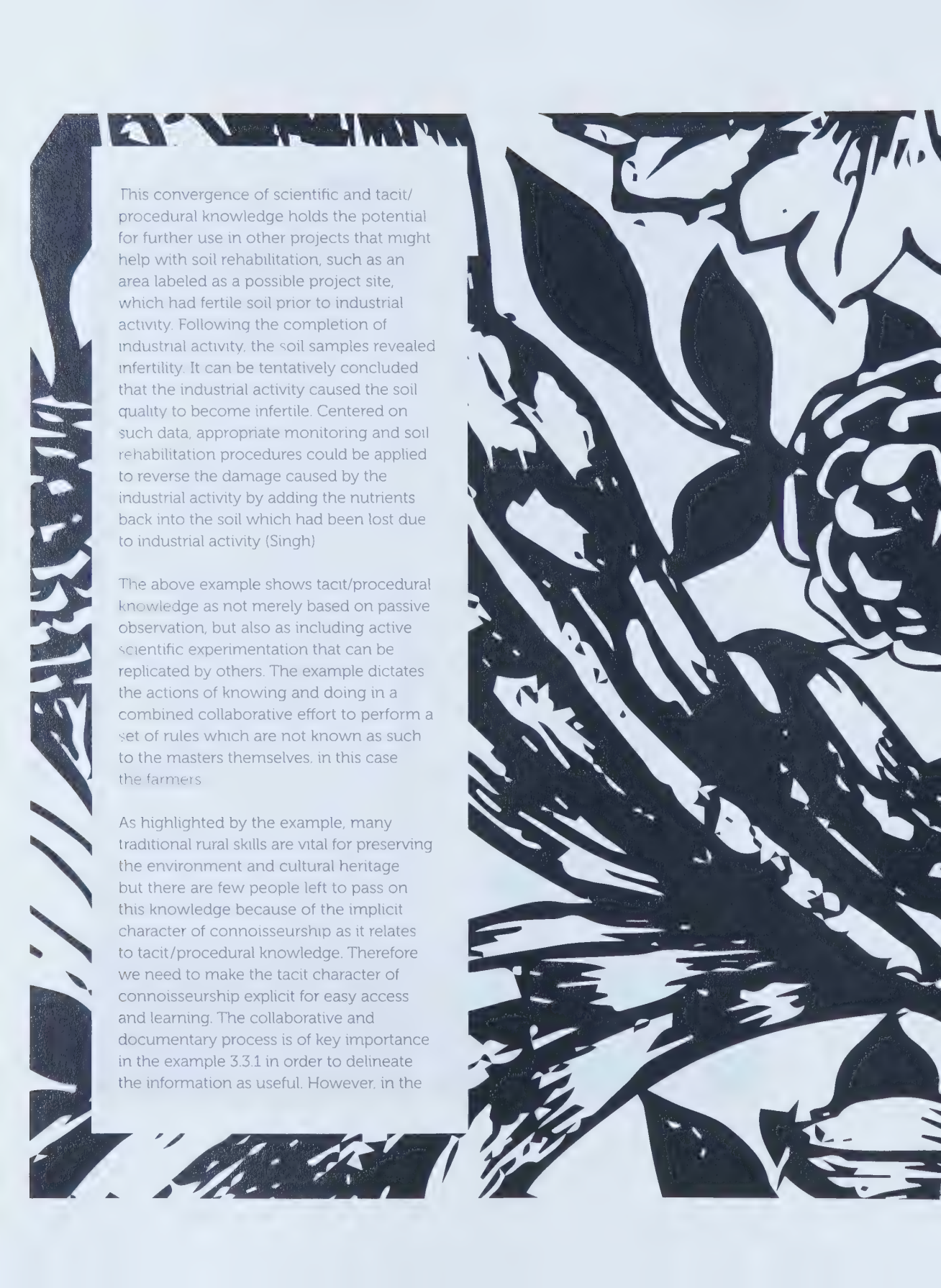
Scientific knowledge is a segment of a much broader arena. Knowledge that spreads outside propositional knowledge moves into the region of tacit knowledge. An instance of this is exhibited in the example of pre- and post-development soil samples, with regard to tacit/procedural knowledge based on experimental approaches.



EXAMPLE 3.3.1:

Dr. Dalbir Singh's research has focused on sustaining the soil fertility at the university farms of Haryana Agriculture University, in India. His approach was allied with collaborative methods to solve the problems at hand. He collaborated with local indigenous farmers to define the soil fertility through observing the ratio of clay to sand, moisture, and the level of decayed organic matter. The observations were only made possible by indigenous farmers through years of experience, which can be deciphered as tacit/procedural knowledge. The information collected was used as data for comparisons of pre- and post-development soil samples. This eliminated the stage of first creating pre- and post-development soil samples. This sort of knowledge has no intentions of undermining or doubting the efficacy of scientific knowledge; instead it enhances the competence of scientific knowledge to make it more useful, accurate, time-saving, and economical.





This convergence of scientific and tacit/procedural knowledge holds the potential for further use in other projects that might help with soil rehabilitation, such as an area labeled as a possible project site, which had fertile soil prior to industrial activity. Following the completion of industrial activity, the soil samples revealed infertility. It can be tentatively concluded that the industrial activity caused the soil quality to become infertile. Centered on such data, appropriate monitoring and soil rehabilitation procedures could be applied to reverse the damage caused by the industrial activity by adding the nutrients back into the soil which had been lost due to industrial activity (Singh)

The above example shows tacit/procedural knowledge as not merely based on passive observation, but also as including active scientific experimentation that can be replicated by others. The example dictates the actions of knowing and doing in a combined collaborative effort to perform a set of rules which are not known as such to the masters themselves. In this case the farmers

As highlighted by the example, many traditional rural skills are vital for preserving the environment and cultural heritage but there are few people left to pass on this knowledge because of the implicit character of connoisseurship as it relates to tacit/procedural knowledge. Therefore we need to make the tacit character of connoisseurship explicit for easy access and learning. The collaborative and documentary process is of key importance in the example 3.3.1 in order to delineate the information as useful. However, in the



example, how does someone know that the soil is fertile? Is it through the way the soil looks, the way the soil smells, how it feels, or a permutation of all three? The example 3.3.1 affirms the problem raised by Polanyi: the transfer of tacit/procedural knowledge consists of the imitation of physical gestures (53). “The body that copies knows far more than the mind, which controls”—this statement describes the following proposed sensorial methodological framework for extracting connoisseurship a tacit aspect of procedural knowledge in practice-led disciplines.

3.4 PROPOSED SENSORIAL METHODOLOGY FRAMEWORK

Over the course of my design education and professional design practice, I have continually explored ways to design through the senses of sight, touch, sound, smell, and taste. The theory of designing using as many senses as possible all started with my undergraduate thesis, “The Edible Book.” Prior to this, I mainly focused on designing entities to look aesthetically pleasing, involving the sense of sight, and on rare occasions, I would use the sense of touch, ignoring the other three senses. However, “The Edible Book” taught me that the increase in even one sense makes design much easier to decipher. Keeping in mind the way we use the product and the way the final design will look makes the designer mindful of the materials to be used in the production process. Essentially, the sensorial methodology is inspired from the practice-led research that went into designing and producing “The Edible Book.”

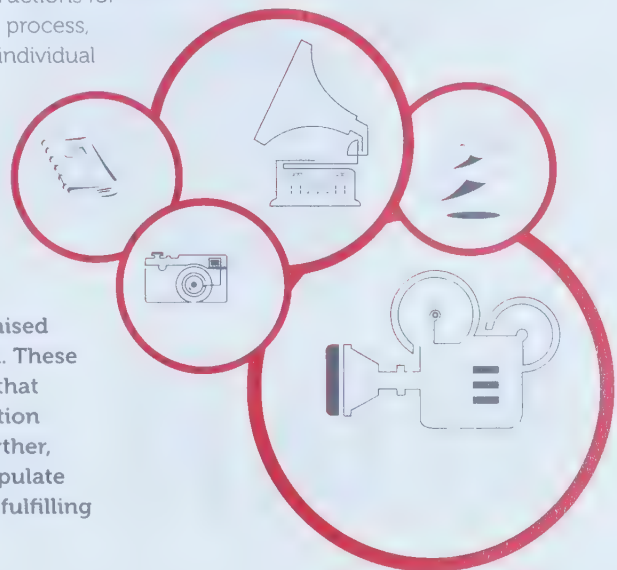
Practice-led research in the field of art and design studies the interplay between a researcher-practitioner and the process of his design work (Frayling 5). It is this interplay that connects practice with the world of research. Documentation condenses the unspoken design experience and makes it discoverable in the context of disciplined probing (Smeyers 479). However, here we are talking about identifying practice-led methods associated with connoisseurship, which is tacit in nature, stored away exclusively in the bank of procedural knowledge of the expert. In fact, even the expert is largely unaware of his or her knowledge. This means that the practitioner may not even be conscious of what he or she is looking for. Extracting something requires that the expert be aware of its existence, and in its entirety, connoisseurship an aspect of tacit knowledge is a form of knowledge of which even the expert is unaware (Polanyi 49). Therefore, the first stage in extracting and documenting this form of tacit knowledge in practice-led research is to make oneself conscious of the tacit/procedural knowledge that one holds. Polanyi suggests an apprentice retains the tacit/procedural knowledge by watching the master and emulating his effort in his presence (53). As a result, the apprentice unconsciously absorbs the rules through the consecutive repetition of physical gestures, and it is these gestures that I am proposing that the apprentice consciously copy to attain the same level of expertise as the master himself within the practice-led task or craft at hand by following the three steps:

The **first step** in extracting tacit/procedural knowledge from the craft skills of practice-led disciplines involves the task of recording and documenting the interplay between the research-practitioner and his artistic or design process. This is accomplished by video and voice recording, note taking, still photography, sketches, or all in a combination that best permits the tactile and visual experience to be accurately recorded and documented. These documents assert a form of awareness that one experiences in the process of practice, making one mindful of one's own design process. Recording the successes and failures in tangible form and also the feelings and smells that an individual experiences when touching and handling a material, or the memory that the design or material evokes, is a reminder of the emotions that are felt during the design process. This also helps to articulate the choices made while creating the design. The information collected through the various mediums would lead, in its raw form, to a form of instructions for each of the stages in the design process, reflecting on the action that an individual takes.

The first step would help designers to learn from their own practice by noting down relevant points or questions raised as an outcome of the raw data. These would be questions or points that encourage thought and reflection during the design process. Further, these questions and points stipulate the necessary information for fulfilling the following two steps.

1

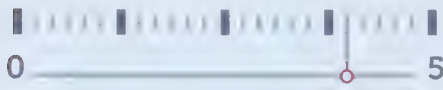
The proposed **Sensorial Methodology** need to be tested to create a workable framework and at this stage the methods present more questions than answers.





HOW TO MAKE
XUAN PAPER

In the **second step**, using the raw form of the collected data, the artist or designer will develop a ranking in accordance with the relative importance of the senses involved in the particular practice in which he has indulged. In other words, using a ranking system, he will rank the senses of vision, touch, sound, smell, and taste that are involved in performing the craft or the task at hand.



In the majority of practice-led disciplines, the sense of vision might always be crucial. However, we are looking for the second or third most important sense, which might even outweigh the sense of vision in a particular phase or in the entire practice one is involved in. The following is an example of the art of making Chinese Xuan paper. The example is divided into sections to explain how the five senses play a crucial role in each of the stages

EXAMPLE 3.4.1:

Many traditional indigenous skills are essential to learning a traditional craft by using the five senses. In my opinion, the experts themselves are unaware of the learning that occurs through the five senses. The art of making Xuan paper is an example of such a traditional indigenous craft. According to Zhang Yanyuan, an art historian of the Tang Dynasty, paper came into existence as early as the eighth century (Tang; Unesco).

Extracting the tacit knowledge of making Xuan paper requires documenting each of

the stages involved in making the paper through audio, video, sketches, and still photography along with a written account. The data next needs to be further analyzed in terms of which of the five senses outweigh the others in each of the stages; this is to be completed by the master. For instance, in one particular step of making the paper, the master tramples pulp until it no longer sticks to his feet. In this particular step, the sense of touch outweighs the others, even vision. In the art of making Chinese Xuan paper, senses play a vital role in fulfilling the 108 steps that go into making the paper (Tang; Unesco).

The journey of making Xuan paper starts in the rice fields of Jing County, located at the feet of Huanshan Mountain in China. In the rice fields, the farmers harvest and collect rice straws. The farming process requires proficiency. It requires the senses of vision, smell, touch, and taste to determine if the crops are growing properly and have enough water. Through the sense of taste and vision, the farmer can tell if the rice crop has reached its gestation period. According to Dr. Dalbir Singh, if the color of the crop has changed to yellow and the rice can't be broken by one's teeth, then the rice is ready to be harvested (Singh). Rice straws are one of the two essential ingredients in the making of Xuan paper. The second most important ingredient is the bark of the *Wingceltis* tree, commonly found in Jing County. The bark fiber of the *Wingceltis* is of high quality due to the inimitable ecological conditions found there. Jing County receives adequate amounts of rain, crucial for rice crops and *Wingceltis* growth. The trees are pruned by locals every three years to encourage their growth; when the trees

give off a certain smell from their flowers and leaves, this informs the locals that it is the right time to prune the trees. That being said, one can be sure the sense of sight is dominated by taste and smell (Tang; Unesco; Singh)

Next, the rice straws and bark are collected to be soaked, steamed, boiled, and mixed. They are later spread out on the hillsides to be washed down by the rain and dried in the natural light of the sun. This process allows for natural bleaching to take place during a span of six months; such drying yards cover an area of more than 1 million square meters. This process of bleaching is the most natural and ancient in the art of papermaking (Tang; Unesco). At the end of six months, the dried straws and the bark appear consistently white throughout, which informs makers that the Xuan paper is ready to move onto the next stage. The components are then all set to be made into a white, soft, extravagant paper. The following steps are a summary of how to transform the bleached mixture of rice straws and bark into Xuan paper.

► First, the paper maker pounds the rice straws, cuts the bark, hulls the bark, and tramples it by foot. Through the senses of vision and touch, the expert judges the thickness and uniformity of the fibers and continues to pound, cut, hull, and trample until the mixture looks and feels consistent (Tang; Unesco). To fully learn and understand this step, there needs to be an in-depth description provided by the expert in the form of audio, video, sketches, and still photography along with a written account of how the rice straw and bark mixture should feel. Essentially, one seeks

to refabricate the thickness and uniformity of the material as if it were created by the expert himself. In addition to the texture, does the smell of the material change at any of the steps to inform the expert of the readiness of the material to be moved on to the next phase?

► The next step involves washing and mixing the materials (Tang; Unesco). Again, in this phase we are looking for a relation to the five senses. Does it have a certain smell or does one see a change in the color of the material? These and many other questions would be part of an in-depth description that needs to be provided by the expert in the form of audio, video, sketches, and still photography along with a written account on which of the five senses are involved in acting out each precise step

► Following the washing and mixing, the material is ready to be drenched; the material is then squeezed, placed in frames and dried in the sun. The paper is now ready.

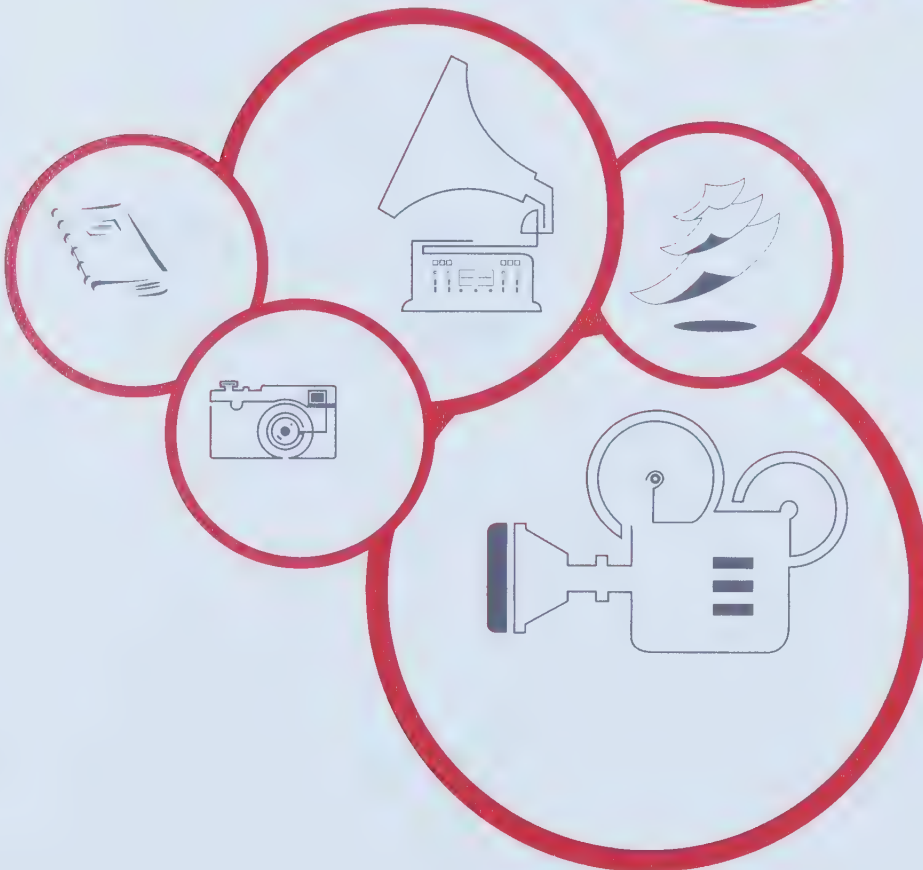
The thickness, uniformity, and integrity of the paper all depend on these and a dozen more actions to be executed with the same precision every time to achieve the same results. This unique method of papermaking, together with its simplicity and wisdom, is inherited from previous generations through oral instructions, and it is these oral instructions that need to be documented in light of the five senses. Xuan paper is a way of life for the Chinese people, a form of tacit knowledge that is embedded in China's cultural heritage.



PRINT MADE ON XUAN PAPER

In the **final step**, the documentation process focuses mainly on delivering the teachable data from the perspective of the senses that are involved in the practice at hand or the senses involved at each of the stages. Basically, it means to learn the craft from the perspective of the senses that are involved in the artistic, design, or any other practice-led discipline one might be engaged in.

3

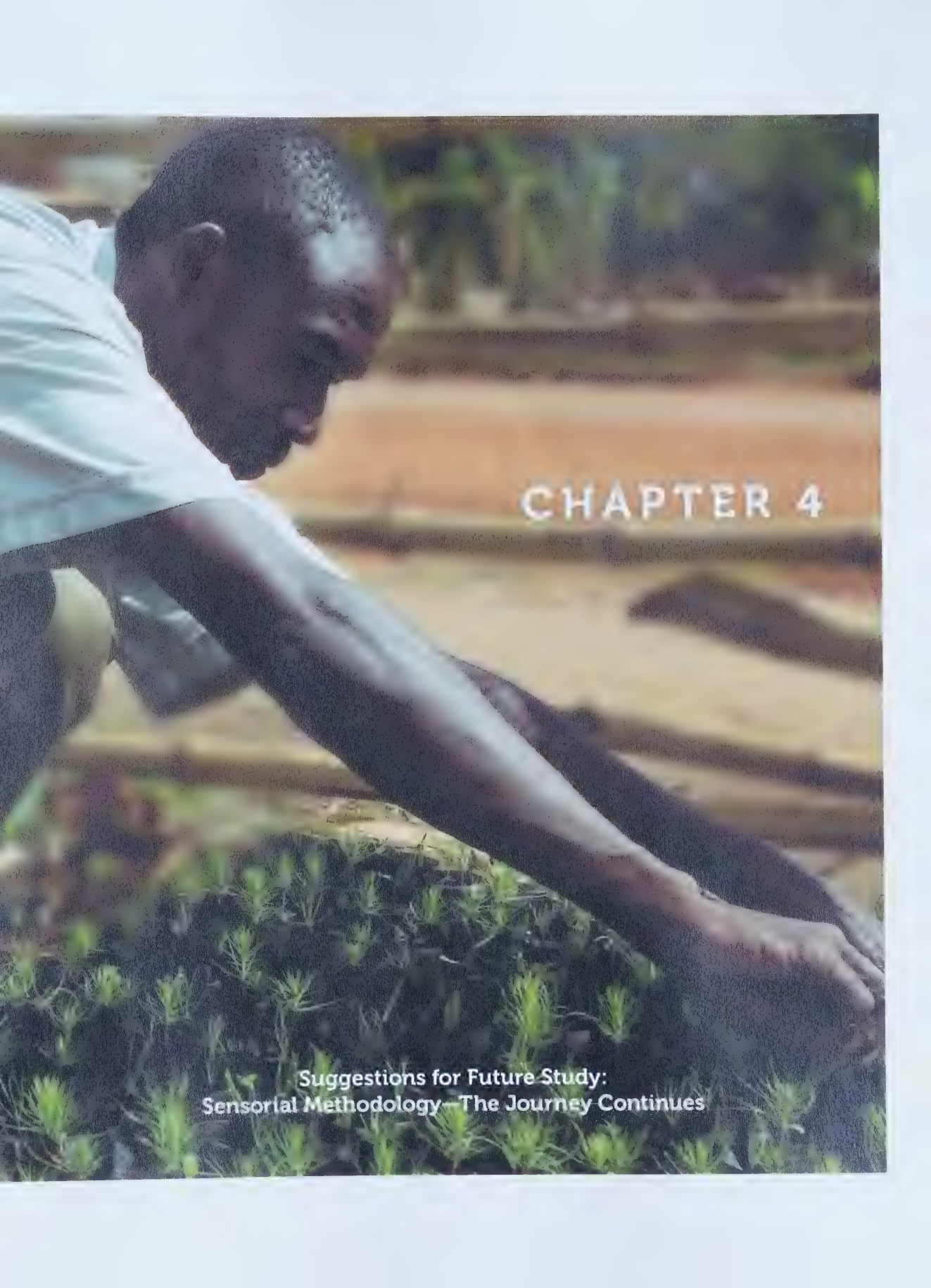


Up to this point, I would speculate that the understanding of the practitioner's discipline, particularly its precision, quality, ease and expertise, would help form a pedagogic approach to consciously transfer tacit/procedural knowledge to the learner through the senses involved in the activity. In traditional apprenticeship situations, this would happen out of interactivity, as the expert would have to be certain that the learner has gained the crucial tacit/procedural knowledge to produce the product with the same quality and appearance as would the master. This form of teaching style is known as the Socratic dialogue, in which the educator governs and controls the learner in order to pass along knowledge, choosing from the materials as one sees fit (Morrell 383–85). The downfall of such a method in today's society is the limitation of time, as the expert only has time to show the learner how to perform the task once. This limits one from attaining the mastery of all of the stages. However, to work around this limitation, if the expert knows and is conscious of his tacit/procedural knowledge, the master could pass it on to the learner by using the sensorial methodology to extract and document each of the stages. The learner could also make use of the stages documented by the expert by revisiting the steps, as many times as necessary, to absorb knowledge effectively. This would propagate a deeper understanding of each of the steps even if the expert has only taught them once. In addition, the learner would be able to learn and perform the task without further help, ultimately achieving the same level of expertise as the master. Using all our senses to disclose tacit/procedural knowledge by making it explicit will not only document the embedded knowledge but also allow us a better understanding of the practice involved. I would tentatively suggest that this form of learning is the ability to learn with empathy, as you would be acquiring the same level of skill as the master, while having the same understanding and emotional output towards a craft or task at hand.

With regard to methodology and conduct, this research pours the foundation to build further research to test the sensorial methodology and carve a tested, workable sensorial methodological framework for data gathering, evaluating, learning, and teaching of connoisseurship a form of tacit knowledge within practice-led disciplines. In order to better understand how to include the awareness of tacit/procedural knowledge within research, the next chapter proposes succeeding research projects to the current Master of Design for future studies.





A photograph of a man with dark skin and short hair, wearing a white short-sleeved shirt. He is leaning forward, reaching his right arm into a field of low-growing green plants. The background is a blurred landscape with a reddish-brown path or field and some trees in the distance. The text "CHAPTER 4" is overlaid in white, bold, sans-serif font on the right side of the image.

CHAPTER 4

Suggestions for Future Study:
Sensorial Methodology—The Journey Continues

As revealed in the previous chapters, tacit/procedural knowledge, by its nature, is difficult verbalization and therefore defies communication, dissemination and knowledge sharing. The development of the proposed sensorial methodology can assist with the transmission of the tacit/procedural knowledge to be made explicit. This reveals methods for unlocking the embedded knowledge of people by employing our sensorial part of research methodology. As a result, this chapter outlines a future research

proposal in the field of design, focusing on achieving the following four objectives.

4.2 FUTURE STUDY OBJECTIVES:

1. Testing the sensorial methodology to carve a workable sensorial methodological framework for data gathering, evaluating, learning, and teaching of connoisseurship a form of tacit knowledge within practice-led disciplines will be the first phase of future research. With regard to research regulations and requirements, where the research can achieve measurable results that can be verified to test the academic credibility needed for research, I would like to test the sensorial methodological framework to acknowledge the existence and importance of connoisseurship within practice-led disciplines. This may allow for research practitioners skills (connoisseurship) to be verified, replicated and used as evidence to achieve the academic credibility equal to that of non-creative disciplines.

2. By employing the sensorial methodology in a pilot practice-led design project, I would like to delve into the hidden wisdom of elders. This would address questions of whether retirees from numerous disciplines, such as ethnographers, engineers, anthropologists, social scientists, environmentalists, economists, geologists, farmers, and related occupations can be brought together with working professionals to take active roles as participants and experienced advisers. This research has the potential to also address whether the interdisciplinary collaboration above would result in design for resilience.

In Toronto, the Kaadinakijik Council is an example of collaboration, providing guidance for the community that seeks the advice of its elders prior to starting any research in indigenous environments (Lavallée 27). Comparably, my objective relates to encouraging elders to come together from numerous disciplines to tackle the sustainability issue. It is essential to understand how a strategy can be designed to develop a system that can

A photograph showing five individuals, likely researchers or students, wearing white short-sleeved shirts and dark trousers. They are all bent over, working in a field of low-lying green plants. The person on the far left is wearing a colorful headband. The background consists of tall grass and some trees under a bright sky. The overall scene suggests a field study or agricultural research.

THIS RESEARCH HAS THE POTENTIAL TO
ADDRESS WHETHER INTERDISCIPLINARY
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DESIGN FOR RESILIENCY.

withstand a certain amount of change and still retain the same controls on function and structure. Essentially, this would be a system that is capable of self-organization and would lure the ability to build sustainable and interactive design practices. In simple terms, it is the impact we have on the environment and the impact the environment has on us

3. The third objective addresses whether the active mind of an elder has a subsequent effect on the body to be independent for a longer period, to allow him or her to continually be an active member of society. Could we see elders as less of a burden on the health care system and more of an asset to society similar to how indigenous communities view their elders? Can they age well in their existing places, or do they always have to be uprooted from their families and friends? Further, does this uprooting have a negative effect on their health? These are questions that will need to be answered and offer a direction for future studies







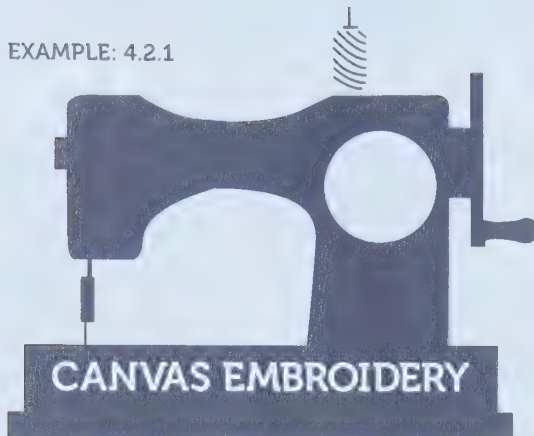


4. Documentation is of vital importance in practice-led research to support research claims and to help one become critical of one's own creative process. Using the proposed sensorial methodology to document an understanding of expertise or connoisseurship might also have applications external to the area of creative practice, particularly in areas where tacit understanding needs to be developed around expertise. Therefore, in the final objective, by using the sensorial methodology, I would like to encourage the documentation of tacit/procedural knowledge found amongst the indigenous people in order to assist with storing that knowledge and solidifying the transfer of the learning process. This knowledge could be about herbal medicine, farming, cooking, textiles, or any other daily activity that could possibly entail benefits not just for the indigenous communities but also for urban populations. Take my examples of how indigenous tacit knowledge helped me in my health condition and how iron levels were improved amongst women and children in Cambodia with the help of "The Lucky Iron Fish"

An example of such an effect can be seen in the doctoral research of Ms. Vick Singh Associate Professor at Haryana Agriculture University in India. Her work is based on the preservation of traditional rural embroidery for cultural heritage



EXAMPLE OF TRADITIONAL RURAL
EMBROIDERY...

EXAMPLE: 4.2.1

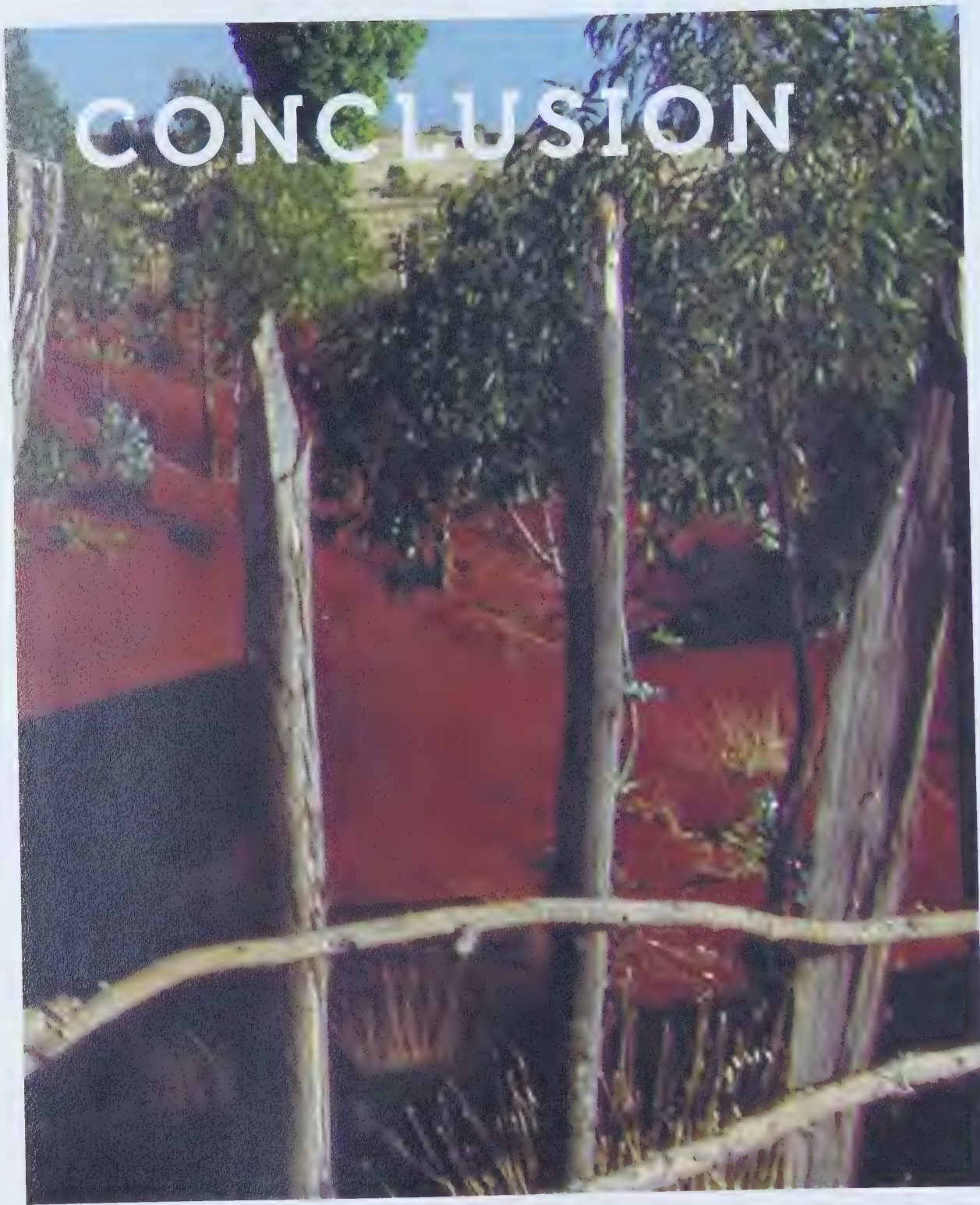
Embroidery is making designs using threadwork on a variety of fabrics to make them more decorative. The tradition of Indian embroidery is one of the most diverse and masterful in the world. Canvas embroidery, for local indigenous women of India, is a form of relaxation because the basic canvas stitches are repetitive, the designs are easy to copy, and the results are always pleasing. The study's aim was to restore and preserve the skills associated with traditional canvas embroidery of local indigenous Indian women embroiderers of Haryana.

A collaborative pilot project with indigenous women and a small urban clothing manufacturer near Delhi attempted to popularize the indigenous art of canvas embroidery by incorporating the craft with contemporary clothing and other design artifacts. This provided a platform for indigenous women to receive a fair wage for their work and recognition for their skills. This research documented the unique art of canvas embroidery, helping to sustain it. Through the collaborative approach, the experts and indigenous women were able to disseminate their tacit knowledge of traditional embroidery to individuals involved in the fabrication of the design artifacts (Singh)

This example describes how researchers and participants can learn and help document the tacit/procedural knowledge found within canvas embroidery. We can learn from this example how to preserve and document connoisseurship a tacit form of procedural knowledge embedded in indigenous communities; it would be beneficial to all involved to have more collaborative design projects for educational, research, or entrepreneurial purposes.

The sensorial methodology designed for this research offer seeds for eliciting connoisseurship a tacit form of procedural knowledge for creative disciplines, in order to attain an equal degree of academic credibility for use within practice-led disciplines. In addition, it erects a platform for interdisciplinary collaboration and dialogue that may utilize the hidden potential knowledge of elders to help sustain their tacit/procedural knowledge

CONCLUSION



This research project has investigated practices, as well as research methods, that are defined as *connoisseurship* to shed light on the type of knowledge entrenched in creative disciplines. It has also addressed how practice-led methods are empathic to indigenous knowledge. The research question has been addressed by looking at the relationship, meaning, role, and format of *connoisseurship* a tacit form of procedural knowledge to be made explicit, with reference made to indigenous knowledge and practice-led methods. The research discusses tacit/procedural knowledge as an action that cannot be defined in steps or disseminated using instructions, as no instructions exist for it; it can only be transferred by example, from master to apprentice (Polanyi 49) through physical gestures. This analysis led to the proposed design of sensorial methodology to work as a pedagogic tool for the purpose of extracting, documenting, verifying, and testing of the embedded tacit/procedural knowledge. In other words, sensorial methods provide conscious control over the action performed within creative and practice-led disciplines to support the idea that "it the body that copies knows far more than the mind, which controls." To this end, I discussed the importance of tacit/procedural knowledge in relation to indigenous knowledge and practice-led disciplines, exhibiting the inevitability of documenting and sustaining tacit knowledge. I established that including *connoisseurship* as a tacit form of procedural knowledge within practice-led research is essential if we are to foster dialogue that addresses design for sustainability, and works towards making tacit/procedural knowledge explicit for the purpose of replicating research findings/outcomes. This could provide measurable results for verification, testing, and transfer of *connoisseurship*.

BIBLIOGRAPHY

- "Applying An Empathic Design Model To Gain An Understanding Of Consumers' Cognitive Orientations And Develop A Product Prototype." (2012): OAIster. Web. 25 Sept. 2013.
- Armstrong, R. Gavin. "The Lucky Iron Fish Project The Shape of Health." luckyironfish.com.2014. Web. 10 May. 2014.
- Bossomaier, Terry R. J. "Introduction to The Senses: From Biology to Computer Science." Cambridge: Cambridge University Press, 2012. eBook Collection (EBSCOhost). Web. 27 Feb. 2014.
- Brody, Hugh. "Maps Of Dreams." *Manoa* 1 (2013): 1. Project MUSE. Web. 9 Mar. 2014.
- Bunnin, Nicholas, and E. P. Tsui-James, eds. "The Blackwell Companion to Philosophy." Malden, Mass.; Oxford: Blackwell, 2003. NEOS's Catalog. Web. 02 Feb. 2014.
- Cajete, Gregory. "Native Science: Natural Laws of Interdependence." Santa Fe, N.M.: Clear Light Publishers, 2000. NEOS's Catalog. Web. 05 Jan. 2014.
- Casey, Kathleen. "The New Narrative Research In Education." *Review Of Research In Education* (1995): 211. JSTOR Arts & Sciences IV. Web. 16 Feb. 2014.
- Chopra, A.K., D.R. Khanna, G. Prasad., D.S. Malik, and R. Bhutani. "Medicinal Plants: Conservation and Cultivation." Delhi: Daya Publishing House, 1974. Print.
- Collins, H. M. *Changing Order: "Replication and Induction In Scientific Practice."* Chicago: University of Chicago Press, 1992. NEOS's Catalog. Web. 05 Feb. 2014.
- Cook, J. "The Role of Dialogue in." In *Changing Order: Replication and Induction In Scientific Practice*, ed. H.M. Collins. Chicago: University of Chicago Press, 1992. NEOS's Catalog. Web. 05 July. 2013.
- Coumans, A. (2003). "Practice-led Research In Higher Arts Education." *On the move: Sharing experience on the Bologna Process in the Arts*, eds. T. Ophuysen and L. Ebert, Amsterdam: European League of Institutes of the Arts (ELIA), 2003. 62–67. Print.
- Cross, Nigel. "Designerly Ways of Knowing." Basel, Switzerland; Boston: Birkhäuser, 2007. NEOS's Catalog. Web. 9 April 2014.

- Dei, George, Jerry Sefa, Budd L. Hall, and Dorothy Goldin Rosenberg, eds. "Indigenous Knowledges In Global Contexts: Multiple Readings Of Our World." Toronto, ON; Buffalo, NY: Published in association with University of Toronto Press, 2000. NEOS's Catalog. Web. 9 Sep. 2013.
- Du, Jia, et al. "Challenges Of Doing Empathic Design: Experiences From Industry." *International Journal Of Design* 6.1 (2012): 59-70. Art Full Text (H.W. Wilson). Web. 20 Feb. 2013.
- Faurot, Jean. "The Concept of Mind By Gilbert Ryle." *Salem Press Biographical Encyclopedia* (2013): Research Starters. Web. 9 Feb. 2014.
- Flavier, J.M., A. de Jesus, and C.S. Navarro. "The Regional Program for the Promotion Of Indigenous Knowledge In Asia." *AGRIS*, 1995. Web. 12 Mar. 2014.
- Fodor, Jerry A. "The Appeal to Tacit Knowledge In Psychological Explanation." *Journal Of Philosophy* 65 (1968): 627-40. *Philosopher's Index*. Web. 14 Feb. 2014.
- Frayling, Christopher. "Artefacts Rather Than Arty Facts." *Times Higher Education Supplement*. 20 May 1994: 9. *Teacher Reference Center*. Web. 6 April 2014.
- Fry, Tony. "A New Design Philosophy." [Electronic Resource] : An Introduction To Defuturing / Tony Fry. n.p.: Sydney: UNSW Press, 1999., 1999. NEOS's Catalog. Web. 19 Oct. 2013.
- Fry, Tony. "Design As Politics." / Tony Fry. n.p.: Oxford ; New York : Berg. 2011., 2011. NEOS's Catalog. Web. 11 Sep. 2013.
- Fry, Tony. "Design Futuring : Sustainability, Ethics, And New Practice." / Tony Fry. n.p.: Oxford, UK ; New York, NY : Berg, 2009., 2009. NEOS's Catalog. Web. 18 Oct. 2013.
- Fulkerson, Matthew. "The First Sense: A Philosophical Study Of Human Touch." Cambridge, MA: MIT Press, 2014. eBook Collection (EBSCOhost). Web. 24 Feb. 2014.
- Gore, Albert. "Our Choice: A Plan To Solve The Climate Crisis." / Al Gore. n.p.: Emmaus, PA: Rodale, c2009., 2009. NEOS's Catalog. Web. 10 Mar. 2013.
- Herbig, B., A. Büssing, and T. Ewert. "The Role of Tacit Knowledge In the Work Context of Nursing." *Journal Of Advanced Nursing* 34.5 (2001): 687-95. *CINAHL Plus with Full Text*. Web. 12 April 2014.

- Holling, C. S., Craig R. Allen, and Lance H. Gunderson. "Foundations Of Ecological Resilience." Washington, DC: Island Press, 2009. eBook Academic Collection (EBSCOhost). Web. 10 Nov. 2013.
- Hopper, Tristin. "Eleven-year-old's Choice to Treat Her Cancer with Indigenous Medicine instead of Chemo May Be Legal, Experts Say." *National Post*. 15 May 2014. Print.
- James, Lindsay and Davis, Mikhail "What's In Your Seed Back? Lessons For Building Resilience." *GreenBiz.com*. GreenBiz Group Inc, 19 Feb. 2014. Web. 25 Feb. 2014.
- Johnson, Jinny May. "Senses." New York: Kingfisher, 2004. NEOS's Catalog. Web. 24 Feb. 2014.
- Kovach, Margaret. "Indigenous Methodologies: Characteristics, Conversations and Contexts." Toronto: University of Toronto Press, 2009. NEOS's Catalog. Web. 15 Sep. 2013.
- Knežić, Dubravka. "Teachers' Education In Socratic Dialogue: Some Effects on Teacher-Learner Interaction." *Modern Language Journal* 97.2 (2013): 490–505. *Communication & Mass Media Complete*. Web. 2 March 2014.
- Lavallée, Lynn F. "Practical Application Of An Indigenous Research Framework and Two Qualitative Indigenous Research Methods: Sharing Circles and Anishnaabe Symbol-Based Reflection." *International Journal of Qualitative Methods* 8.1 (2009): 21–40. *Academic Search Complete*. Web. 27 Sep. 2013.
- Morrell, Kevin. "Socratic Dialogue as a Tool for Teaching Business Ethics." *Journal of Business Ethics* 53.4 (2004): 383–92. *Business Source Complete*. Web. 2 March 2013.
- Neuweg, Georg Hans. "On Knowing and Learning: Lessons from Michael Polanyi and Gilbert Ryle." *Appraisal: A Journal Of Constructive And Post-Critical Philosophy And Interdisciplinary Studies* 4.1 (2002): 41–9. *Philosopher's Index*. Web. 20 April 2014.
- Polanyi, Michael. "Personal Knowledge: Towards a Post-Critical Philosophy." London: Routledge, 2003. NEOS's Catalog. Web. 02 Feb. 2014.
- Rotarangi, Stephanie J., and Janet Stephenson. "Resilience Pivots: Stability And Identity In A Social-Ecological-Cultural System." *Ecology & Society* 19.1 (2014): 502–511. *Environment Complete*. Web. 1 Jun. 2014.
- RUIZ ADOLFO. "Sharing Stories and Moving Pictures Animating Oral History in the Tlcho Region." MDes thesis. University of Alberta, Edmonton, 2014.

- Scrivener, S. "The Roles of Art and Design Process and Object in Research." In *Reflections and Connections: On the Relationship between Creative Production and Academic Research*, eds. N. Nimkulrat, N. and T. O'Riley. Helsinki: University of Art and Design Helsinki, 69–80. Print.
- Singh, Dalbir. "Personal Interview." 19 March 2014.
- Singh, Vick. "Personal Interview." 21 April 2014.
- Smith, Linda Tuhiwai. "Decolonizing Methodologies: Research and Indigenous Peoples." London; New York: Zed Books; Dunedin N.Z.: University of Otago Press, 1999. NEOS's Catalog. Web. 11 June. 2013.
- Smeyers, Paul. "'What It Makes Sense to Say': Education, Philosophy and Peter Winch On Social Science." *Journal Of Philosophy Of Education* 40.4 (2006): 463–85. Education Research Complete. Web. 15 Mar. 2014.
- Spear, Steven, and H. Kent Bowen. "Decoding The DNA Of The Toyota Production System." *Harvard Business Review* 77.5 (1999): 96-106. Business Source Elite. Web. 10 Jan. 2014.
- Starszakowna, Norma. "The Concept Of Knowledge." *Working Papers In Art & Design. Directory of Open Access Journals*, 2002. Web. 26 Mar. 2014.
- Steinhauer, Patricia. "Situating Myself In Research." *Canadian Journal of Native Education* 25.2 (2001): 183–87. ERIC. Web. 20 Sep. 2013.
- Tang, Y, and GJ Smith. "Fluorescence And Photodegradation Of Xuan Paper: The Photostability Of Traditional Chinese Handmade Paper." *Journal Of Cultural Heritage* 14.6 (n.d.): 464-470. Arts & Humanities Citation Index. Web. 19 Jun. 2014.
- Unesco. "The Traditional Handicrafts of Making Xuan Paper." YouTube. YouTube, 25 September 2009. Web 12 May 2014.
- Unknown, "Indigenous Worldviews, Knowledge, and Research: The Development of An Indigenous Research Paradigm." OAIster, 2010. Web. 29 Sep. 2013.
- Waldram, James. 1986. "Traditional Knowledge Systems: The Recognition of Indigenous History and Science." *Saskatchewan Indian Federated College Journal* 2(2):115-124.
- Wilson, Shawn. "What Is An Indigenous Research Methodology?" *Canadian Journal of Native Education* 25.2 (2001): 175–79. ERIC. Web. 19 Feb. 2014.

Wiseman, Theresa. "Toward a Holistic Conceptualization of Empathy for Nursing Practice." *ANS. Advances In Nursing Science* 30.3 (2007): E61–E72. MEDLINE. Web 10 Dec 2013.

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GLOSSARY OF TERMS

ANECDOTAL Personal accounts rather than facts or research not necessarily true or reliable.

BENEVOLENCE A sense of creating profound balance and harmony. A commitment to achieve an alignment with the interests of other people, nature and your own.

CONNOISSEURSHIP To have expert practical knowledge for achieving the best results in research and practice, a term used in creative or practice-led disciplines. Similar in concept to the tacit/procedural knowledge.

DESIGN FOR RESILIENCE When a system or design possesses the elasticity to bear disruptions over time yet desist from coming to a point where that elasticity would break. It is the ability to build and increase the capacity for learning and adaptation, and be amenable to changing economical, cultural and environmental disruptions.

DESIGN IN ANTHROPOLOGY

Anthropological research methods involve studying people by gathering data through participant observation, field research, survey research, archival research, interviews, autoethnographic research, and related. Anthropological research methods can inspire designers to connect with people through investigative research methods on how people interact with objects, spaces, or culture to facilitate

a firm understanding of a user's social and cultural experience, even taking people's everyday lives as inspiration for the designs. Using anthropological research techniques to design a particular medium can help the design shape its surrounding culture.

DESIGN FOR SUSTAINABILITY

Sustainability is about promoting forward-thinking decisions that consider the environmental, economical and cultural implications of our actions through time. The notion of sustainability essentially means taking more holistic approaches to designing in order to mimic the best behaviors of the natural environment.

EMBODIED KNOWLEDGE A type of knowledge where the body knows how to act without conscious thought. Similar in concept to the tacit/procedural knowledge.

EMPATHIC DESIGN Employs methods of design that provide an opportunity for the designer to understand what it feels like to be in another person's world, to have a clear viewpoint of the aggravation and obstacles that the other encounters. It is a connection with an experience, emotion or something within oneself that knows that feeling as a means to connect with the other. Empathic design aims to avoid designing for the persona of the ideal user; it reveals methods to discover opportunities to tailor the design for actual people.

EXPLICIT KNOWLEDGE Knowledge expressed and recorded as words, numbers,

codes, mathematical and scientific formulae, and musical notations. Explicit knowledge is easy to communicate, store, and distribute, and is the knowledge found in books, on the web, and through other visual and oral means. Opposite of tacit knowledge.

FETE: FROM EARTH TO EARTH Comes from the philosophy of Benevolence. In its totality, it is about first giving and then receiving; you think of others and the others will think of you. It is this cycle that maintains that balance and harmony of fete.

INDIGENOUS KNOWLEDGE Is the aspect of collaborative knowing, doing and disseminating of methods of knowing, seeing, and thinking that are passed down from generation to generation.

INTERDISCIPLINARY DESIGN The combination of two or more different disciplines to create a hybrid artifact.

INTERDISCIPLINARY THINKING Use of skills and knowledge from more than one discipline.

MORE HOLISTIC Is an approach in which the practitioner considers tangible or intangible materials, methods, systems or artifacts as an interconnected whole which is economical, cultural, environmental, and sustainable in a broader perspective.

PRACTICE-BASED A practitioner who advances an exploration assumed in order to gain new knowledge by means of practice and the outcomes of that practice. This includes artifacts such as designs, paintings, drawings, images, music, models,

prints, digital media or other outcomes such as performances and exhibitions.

PRACTICE-LED A practitioner who is concerned with the methods of practice in creative or practice-led disciplines and leads to new methods as a means to justify the choices made in the making of the artifact.

SECONDARY RESEARCH Reviewing a collection of data or findings that have previously been published by an outside party, for an alternative function.

SENSORIAL METHODOLOGY The embodied knowledge obtained using a combination of all the senses: sight, touch, sound, smell, and taste.

TACIT/PROCEDURAL KNOWLEDGE An element of tacit knowledge that integrates the knowledge of how to do a task with expertise or connoisseurship.

TACIT KNOWLEDGE It is highly personal, hard to formalize and difficult to communicate to others. The challenge is to identify which elements of tacit knowledge can be captured and made explicit—while accepting that some tacit knowledge just cannot be captured. Opposite of explicit knowledge.

APPENDIX 1:

Ellen Bielawski is a research associate of the Arctic Institute of North America. This paper is based on a presentation to the American Association for the Advancement of Science, Washington, D.C., 1991, in the symposium, "The Anthropology of Science and Scientists".

CASE STUDIES II: AN ETHNOGRAPHY OF ARCTIC SCIENCE

The second case study begins with a significant contrast between Inuit knowledge and science. Inuit do not separate people from nature. Arctic scientists do. As one scientist said to me, "It's a little bit different in archaeology and anthropology, but in geology or biology, people are overburden." (Background interview, June 1990, Resolute Bay, N.W.T.). The bifurcation between culture and nature, and between social and natural sciences (see Margolis 1987:xv) in Arctic research denies the unity of people and nature in Inuit interpretations of the world and strategies for living in it.

Fienup-Riordan takes this contrast further in her work on Yuptik Eskimo ideology. She writes that Western science assumes an inherent differentiation between humans and animals and focuses on the explanation of the relationship between originally independent parts; the Yup'ik Eskimos stand this basic assumption on its head and assume, for instance, that men and animals are analogically related as human and nonhuman persons...the focus of explanation shifts to the creation

of differentiation out of an original unity" (Fienup-Riordan 1990:4).

This contrast led to such things as Canada relocating Inuit to the High Arctic without grasping any of the inseparable social and natural implications for the Inuit. It led to many of the western strategies for community development, medicine, education, and justice that have isolated Inuit from at least half of their reality, the natural world. It also led me to my second case study in progress, an ethnography of arctic science.

Firmly grounded in the western intellectual tradition, arctic science nevertheless differs in specifiable ways from science that is geographically, financially, and culturally closer to its southern support bases. Arctic science is shaped by environment (e.g., low species diversity, polar extremes); history (e.g., four nations conducting science and applying technology amidst Inuit culture) politics (e.g., sovereignty in the Arctic); and humanism (e.g., the Arctic in the southern imagination; wilderness conservation). Arctic science attracts some who prefer its vastness and extremes for its own sake; others who find it free of the "overburden" of a western-educated public, paying taxes for research. Some see it as a "playground", others as the key to global research questions (Background interview, Geological Survey of Canada, Ottawa, November 1990.) Arctic science is, willingly or unwillingly, being influenced by the social context in which it is conducted (Bielawski 1984; Colorado 1988; Cruikshank 1981, 1984; Freeman and Carbyn 1988;

Johnson 1987; Mercurieff 1990; Waldram 1986). This influence has thus far been primarily empirical. Life scientists, for example, recognize Inuit taxonomic data, but append it to studies that are classical western science (see Nakashima 1988).

The ethnography involves documenting the customary research behaviours, beliefs, and attitudes of a sample of Canadian arctic scientists. Definition of research problems, education, and initiation rites are all part of the study. Scientists from three research institutions with critical influence in Canadian Arctic science are involved- the Geological Survey of Canada, the Polar Continental Shelf Project, and the Canadian Wildlife Service.

CONCLUSION

Taken together, the case studies should illuminate how Inuit knowledge and arctic science both contribute to understanding the Arctic. Each is successful in specific realms. Inuit knowledge has both a moral and practical place in the contemporary Arctic (for comparative studies see Overing 1985). But no Inuk will abandon her or his antibiotics, electric sewing machine, or snowmobile. An intellectual tradition crossing and integrating Inuit knowledge and western science does not yet exist, and it is not yet possible for me to say what an Inuit 'science' might consist of in the future (Bielawski 1990:19). Nor is it possible to construe what an Arctic science integrating indigenous knowledge in some way beyond empiricism could say about the world.

REFERENCES CITED

- Bielawski, E. 1990. "Cross-cultural Epistemology: Cultural Readaptation through the Pursuit of Knowledge." Paper presented at the Seventh Inuit Studies Conference, Fairbanks, Alaska, August 1990.
- Bielawski, E. 1984. "Anthropological Observations on Science in the North. The Role of the Scientist in Human Development in the Northwest Territories." *Arctic* 37(1):1-6.
- Borofsky, Robert. 1987. *Making History: Pukapukan and Anthropological Constructions of Knowledge*. Cambridge University Press.
- Colorado, Pam. 1988. "Bridging Native and Western Science," *Convergence* Vol. XXI, No. 2 & 3, pp. 49-69.
- Cruikshank, Julie. 1981. "Legend and Landscape: Convergence of Oral and Scientific Traditions in the Yukon Territory." *Arctic Anthropology* XV11-2:67-93.
- Cruikshank, Julie. 1984. "Oral Tradition and Scientific Research: Approaches to Knowledge in the North." In *Social Science in the North: Communicating Northern Values*. Occasional Publication No. 9, Association of Canadian Universities for Northern Studies.
- Cotret, R.R. 1991. Letter to the Editor. *Arctic Circle* 1(4):8.

- Denny, J. Peter. 1986. "Cultural Ecology of Mathematics: Ojibway and Inuit Hunters." In *Native American Mathematics*. Edited by Michael P. Closs, p. 129-180. University of Texas Press, Austin.
- Fienup-Riordan, Ann. 1990. "A Problem of Differentiation: Boundaries and Passages in Eskimo Ideology and Action." Paper presented at the Seventh Inuit Studies Conference, Fairbanks, Alaska, August 1990.
- Freeman, M.M.R. and L.N. Carbyn (Editors). 1988. *Traditional Knowledge and Renewable Resource Management*. Boreal Institute for Northern Studies Occasional Publication Number 23.
- Gellner, Ernest. 1985. *Relativism and the Social Sciences*. Cambridge University Press.
- Jarvie, Ian. 1986. *Thinking About Society*. Boston Studies in the Philosophy of Science, Vol. 93. D. Reidel Publishing Company, Boston.
- Johnson, Martha. 1987. "Inuit Folk Ornithology in the Povungniuk Region of Northern Quebec." Master of Arts Thesis, University of Toronto, Department of Anthropology and Institute for Environmental Studies.
- Legat, A. 1990. Personal communication, by letter, from the Director of Policy and Planning, Department of Culture and Communications, Government of the Northwest Territories, Canada, November 21.
- Margolis, Joseph. 1987. "Science Without Unity: Reconciling the Human and Natural Sciences." *The Persistence of Reality*, Volume 11. Basic Blackwell, Oxford, U.K.
- Merculieff, Larry. 1990. "Western Society's Linear Systems and Aboriginal Cultures: The Need for Two-way Exchanges for the Sake of Survival." Address Presented at the Sixth International Conference on Hunting and Gathering Societies, Fairbanks, Alaska, May 30. Available from Commissioner's Office, Dept. of Commerce and Economic Development, State of Alaska.
- Nakashima, D.J. 1988. "The Common Eider (*Somateria millissima sedentaria*) of eastern Hudson Bay: a survey of nest colonies and Inuit ecological knowledge." *Environmental Studies Revolving Funds*, Report No. 102. Research Department, Makivik Corporation, Lachine, Quebec.
- Overing, Joanna (Editor). 1985. *Reason and Morality*. Tavistock Publications, London and New York.
- Salmond, Anne. 1985. "Maori epistemologies". In *Reason and Morality*, edited by Joanna Overing, pp. 240-263. Tavistock Publication, London and New York.
- Sayer, Andrew. 1984. *Method in Social Science: A Realist Approach*. Hutchinson, London.
- Tuniq, Martha. 1985. Interview at Wakeham Bay. Avataq Cultural Institute, Oral History Project.

